

Advances in Twin Studies Related To Borderline Personality Disorder

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Abstract: Borderline personality disorder (BPD) is a mental disorder with complex causes. The influencing factors include genetic and environmental factors. This paper mainly concluded twin studies on BPD in recent years. Studies have found that the genetic influence of BPD included methylation caused by childhood maltreat, and some CpG sites on X chromosome that were associated with abnormal methylation levels in BPD patients had been identified. Genetic influence increased with age and tended to stabilize in adulthood. The influence of environmental risk factors on children was greater than on an adult. Maternal BPD trait, improper parenting behavior and discordant marriage of parents showed environmental influence, while the paternal BPD trait and inappropriate behavior (alcoholism, drug addiction, and antisocial behavior) showed genetic influence. In addition, antisocial personality disorder, substance use, loneliness, anxiety disorder, depressive, trait anger and adult attention-deficit hyperactivity disorder may have associations with BPD and most of them showed strong genetic correlations, indicating shared genetic etiological factors.

1. Introduction

Defined by Gunderson and Kolb, the symptoms of Borderline Personality Disorder (BPD) have been integrated into the classifications of contemporary psychiatry in 1978 [1]. The typical symptoms of BPD include unstable interpersonal relationships, strong or extreme emotional reactions, and distorted self-perception [2]. Those symptoms usually last for a long term and lead to dangerous reactions like self-harm or other behavior [2]. BPD has been verified to be familial that involves both genetic and environmental factors, and most people reported symptoms in their early adulthood, or later adolescence [1]. The common treatment of BPD is psychotherapy, typically cognitive behavior therapy and dialectical behavior therapy [2].

Causes of BPD are very complex, including genetic factors, brain abnormalities, neurobiological diseases, and environmental factors such as childhood trauma [3]. According to research, the heritability of BPD is between 37% to 69% [4]. And studies also verified that environmental factors especially trauma in childhood is strongly associated with BPD [5]. Another study shows two kinds of brain activity patterns were able to increase the brain reaction to emotional pain and reduce the brain response of subsiding the painful emotion [6]. Nevertheless, both those reports agreed that the start and development of BPD are highly associated with genes and the family environment.

Twin study is the typical method for estimating the interaction of genetic and environmental influence of mental diseases. And it can also be used to observe the pattern between the BPD trait and environmental factors. In this paper, the team searched and analyzed the twin study of BPD in this century, especially those between 2010 and 2020. The aim is to have a rough idea of the research mode

about BPD in recent years. Therefore, by doing this, analyzing the concrete impact factor of BPD, finding the specifically associated factor in the environmental influence, and estimating the risk of other complication diseases in BPD patients. Also, with the comprehensive analysis of these studies, attempt to make a change in future researches in the research objective, method, et cetera.

2. The Genetic Nature of Borderline Personality Disorder

2.1 The Genetic and Environmental Generality of Borderline Personality Disorder

Recent knowledge about BPD Borderline personality disorder reveals several factors that cause genetic influence on heritability and the risk of BPD. Neurobiological and psychosocial factors as well as genetic vulnerability all play an important role in existing of BPD through the genetic pathway [6]. To be more specific, BPD often occurs with existing of childhood trauma or genetic mutation on chromosome nine. However, as for a complex bio-psychological disorder, single factors are often not the direct consequence for it. Interactions between genetic and environmental effects work together to finally cause such a serious disease.

Genetic influence can be initiated through environmental factors as many events are able to cause epigenetic mutation. Psychosocial background including young age trauma, parental illness, and inappropriate raising lead to a neurobiological change in a BPD patient. Those biological backgrounds include altering of the hypothalamic-pituitary-adrenal axis, neurotransmission, endogenous opioid system, and neuroplasticity; and their effect had been discovered through brain imaging study [6]. Environment shapes the genetic expression while genetic expression reverses influence future experiments. Thus, learning a combination of genetic and environmental effects is important for revealing BPD disease.

2.2 Genetic Studies on Borderline Personality

A study in 2015 reveals how BPD patients' experience directly led to the existence of such illness through epigenetic programming. Researchers focus on determining the effect of child maltreatment on epigenetic progressing-gene methylation. A whole-genome methylation scan was being used and they discovered several CpGs and miRNA that show methylation differences based on child maltreatment [7]. Unlike most research that focuses on the genome directly, Prados' experiments reveal a significant influence of MicroRNA (miR124-3) on the risk of BPD. However, in the CpGs section, only several possible genes are being listed but the mechanism to cause the disease is still not being discovered.

Recently, the role of CpGs on Borderline personality disorder has been ascertained by carefully examining the relationship between CpGs and gene methylation. An epigenome wide study set up by Arranz examined two groups of BPD patients. They control most variables and the only difference between those two groups is whether having childhood trauma. They find out that CpG sites in the X chromosome including PQBP1, ZNF41, RPL10, cg07810091 and cg24395855 show an obvious low level of gene methylation than the healthy control group [8]. This result represents that epigenetic alterations were more frequently found in genes controlling estrogen regulation, neurogenesis and cell differentiation [8].

Despite examining specific genetic factors, determining the difference between genome and environmental influence on BPD is also quite important. The adoptive study is a good method for distinguishing different factors to genetic or environmental influence parts. Fatimah and his colleagues used the adoptive study and twin study method to finally conclude the result that parental externalizing psychopathology and father BPD traits play a role in BPD's genetic trait while maternal factors play a more important role in the environmental trait of BPD [9].

2.3 Factors Influencing Borderline Personality Disorder

Research in 2015 used a longitudinal twin study and concluded that borderline personality disorder (BPD) traits tend to be more stable from early to middle adulthood. The main reason is that based on the stable risk of genetic, the environmental risk factor in adulthood is mostly transitory and had less

impact on adults than on children [10]. An early study in 2009 supported this view. A study by Bornovalova in 2009 indicated that though the heredity of BPD seems stable in all ages, the impact from specific environmental factors dropped from adolescent to adult [11]. This study also reveals the importance of the longitudinal study in BPD.

A twin study in 2019 indicated that BPD traits from the maternal line which were associated with improper parenting behavior and discordant marriage of parents constituted the environmental risk of BPD offspring [9]. And this study also showed that the paternal BPD trait and inappropriate behavior (alcoholism, drug addiction, and anti-social behavior) significantly indicated the BPD trait in the bio-offspring [9]. In 2020, research from Schermer shows that the loneliness that BPD patients felt related to the degree that they get accompanied. And the suicidal tendency came more from both peer and family related loneliness, but self-harm was only aroused by family-related loneliness [12].

A study in 2013 revealed the association between substance use (drug use) and BPD risk, and it showed that BPD traits combined with drug abuse in puberty are the common consequence of various risk factors rather than a single one [13]. A recent study also showed that BPD may have a latent influence factor on substance use [6]. This risk factor can be specific, and the effect is environmental and genetic unconfounded [6].

In a study of anger traits with BPD and other impact factors in 2015, researchers found that different BPD traits were associated with different anger type [14]. Borderline self-harm was related to both types of anger temperament, but borderline negative relations only related to the anger reaction [14]. Another study in 2021 indicated that childhood trauma could influence the genetic expression of BPD [8]. In this study, compared with their control group, the BPD patients with trauma had a higher methylation level difference than those who did not have trauma in their childhood [8].

3. Comorbidities of Borderline Personality Disorder

3.1 Comorbidity of Borderline Personality Disorder and Antisocial Personality Disorder

Define abbreviations and acronyms the first time they are used in the text, even after they have been defined in the abstract. Abbreviations such as IEEE, SI, MKS, CGS, sc, dc, and rms do not have to be defined. Do not use abbreviations in the title or heads unless they are unavoidable. Antisocial personality disorder (ASPD) and borderline personality disorder (BPD) often co-occur [15]. The study has shown that common genetic factors probably played an important role in the comorbidity [16]. Like BPD, ASPD is also characterized by impulsivity and a lack of empathy. Although both BPD and ASPD may show sensitivity to criticism and frustration, ASPD generally does not have the strong feelings of negativity and self-loathing that BPD does.

A twin study spanning ten years from early adulthood to middle adulthood showed that genetic factors affecting ASPD and BPD showed high stability, while environmental influences varied greatly [10]. The phenotypic correlation between ASPD and BPD was consistently about 0.50, although the mean criterion count for both ASPD and BPD decreased. The genetic correlation between ASPD and BPD was 0.73 and the environmental correlation was 0.43, showing a strong common genetic influence [10].

3.2 Comorbidity of Borderline Personality Disorder and Substance Use

From the fact that borderline personality disorder. Has a symptom of unstable control in mood, self-image, and behavior [2]. These symptoms are likely to result in related hardships. Also, having difficulty with uncontrollable anger and depression [2]. The people who have BPD will likely take drugs to release the pressure from their social problems of their own. Also, with this long-term emptiness they have from the BPD symptoms, they will likely take drugs to stop this feeling. In consequence, they will be having a hard time restricting themselves to take drugs. so, as they get addicted to drug use, they still have the problem of BPD taking in life social problems [17]. As the drug resistance goes on, they will either take in more efficient drugs or take more drugs, which eventually have them [18].

3.3 Comorbidity of Borderline Personality Disorder and Loneliness

Loneliness is not just a subjective emotion that everyone feels from time to time. For some people, loneliness can even be considered a chronic illness [19]. In 2020, J. A. Schermer examined the correlation between several dimensions of borderline personality disorder (BPD) and loneliness, as well as the phenotypic, genetic and environmental correlations [12]. The overall phenotypic correlation between BPD and loneliness was 0.51, of which about half was due to genetic factors, and the rest was due to non-shared environmental factors. Among the dimensions of BPD, self-harm was the least correlated with loneliness while identity disturbance was the most relevant [12]. However, this study was a cross-sectional study, so it was impossible to judge whether there was a causal relationship between BPD and loneliness.

3.4 Comorbidity of Borderline Personality Disorder and Anxiety Disorder

When a person has a borderline personality disorder, they are usually nervous due to their social circle or some unstable actions, such as spending a lot of money, taking drugs, and. these symptoms have some relationship with anxiety symptoms. These anxiety symptoms include responding to things with fear and dread, anxiety affecting your ability or function, over reacting to something that triggers your emotion, and uncontrollable reaction toward responses to situations [20]. As well as anxiety, anxiety disorder includes generalized anxiety disorder, panic attack, phobias, separation anxiety [2]. So when the two diseases come together it deepens the effect of their common symptoms, such as feeling extremely depressed or even strong suicide wants, which we can find out the times they wanted to suicide, they go to hospitals and psychotic symptoms [2]. Which concludes one thing is that over half of the participants have two or more anxiety symptoms and the most common comorbidity is social phobia.

3.5 Comorbidity of Borderline Personality Disorder and Depressive

A 2010 study examined the correlation between major depressive disorder (MDD) and a variety of personality disorders, as well as shared genetic and environmental risk factors [21]. The phenotypic correlation between MDD and borderline personality disorder (BPD) was 0.44, and the environmental and genetic correlation was 0.39 and 0.56, respectively, which was both highest among all the personality disorders measured in the study [21]. Another study focusing on depressive personality disorder (DPD) showed that the phenotypic correlation between DPD and BPD was 0.51, and the environmental and genetic correlation was 0.37 and 0.65, respectively [22]. In this study, the phenotypic correlation with ASPD was the highest ($r=0.52$) for BPD, followed by DPD ($r=0.51$) and histrionic personality disorder ($r=0.50$) [22].

3.6 Comorbidity of Borderline Personality Disorder and Trait Anger

The common symptoms between trait anger and borderline personality disorder are the ones with uncontrollable anger which happens often. The likely symptom of them all is to have uncontrollable emotions, especially anger since trait anger's effect is to raise the level of anger when you are in bad mood [2]. Usually, they exist tougher, and with the appearance of anger. Due to this disease, they will be in constant anger. In the long term it will cause extreme health problems such as higher blood pressure and multiple cardiovascular reactivities, other physical symptoms, psychological problems and social relation impacts [23]. In this case, they have an environmental factor of 6%, whereas genetic influences are 54% [24]. One thing to know is that they are shared genetic influences of each other, and they tend to get away from the close people they know of, such as family. from one end of loving to sudden hatred.

3.7 Comorbidity of borderline personality disorder and adult attention-deficit hyperactivity disorder

In 2011, M. A. Distel examined the correlation between adult attention-deficit hyperactivity disorder (ADHD) and borderline personality traits (BPT) [25]. The phenotypic correlation between ADHD and BPT was 0.59, explained for 49% by additive genetic factors, and the environmental and

genetic correlation was 0.51 and 0.72, respectively. In addition, individuals diagnosed with ADHD in childhood were more likely to develop BPD in adulthood. Also, traumatic events in childhood could lead to BPD. Thus, there may be an interaction between genotype and adverse environmental influences in childhood which contributed to the development of BPD in adulthood [25].

4. Conclusion

Borderline personality disorder is a mental disorder with different causes. One of the causes is caused by childhood maltreat. This is due to the influence of environmental risk factors. It influences children more than adults. Yet, genetic influences of BPD at the adult period are greater in comparison to childhood time. However, most people get to appear the symptoms of BPD in early adulthood or late adolescence. Which we can conclude that it was due to the pressure from working or studying. The common treatment for BPD is psychotherapy, typically cognitive behavior therapy and dialectical behavior therapy [2]. In addition, antisocial personality disorder, substance use, loneliness, anxiety disorder, depressive, trait anger and adult attention-deficit hyperactivity disorder have related symptoms with BPD. The reason we have done this essay was to find and conclude what researchers to have discovered in the last 10 years. In the future, our research direction may be up on what is the cause of borderline personality disorder since there is less article that is on this topic, where the most important is not to get the disorder instead of curing the disorder. Preventing is always better than curing after getting the disease.

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