REVIEW ARTICLE

Neurological Effects of Covid-19: Cluster B Personality Disorders?

Sam Vaknin*

Vaknin S. Neurological Effects of Covid-19: Cluster B Personality Disorders?. Int J Psychopathol Psych Diag. 2025;2(2):98-109.

Abstract

The effects that Covid-19 has on the central nervous system and on the brain of patients with Covid-19. The clinical picture that emerges from neuro imaging of the brains of these patients indicates that: One, the damage to the central nervous system and the brain seems to be at this stage irreversible and the second thing is that the clinical picture resembles cluster B personality disorders, such as antisocial personality disorder and borderline personality disorder.

Key Words: *COVID-19; Personality disorders; Borderline personality disorder; Psychopathy; Antisocial personality disorder; Brain; Traumatic brain injury*

Introduction

Covid-19 presentation and history

The covid-19 pandemic is creating an army of people whose behaviors and traits are indistinguishable from psychopaths and people with borderline personality disorder and because we are talking about half of these patients including asymptomatic patients at this stage of the pandemic we are already talking about at least 25 million people whose brains have been modified by the SARS virus in a way which is clinically and diagnostically indistinguishable from the most severe forms of cluster B personality disorders.

Even now, we know very little about the virus's after-effects and especially how it interacts with the brain and whether these interactions are indeed reversible. But it is already clear that we will be faced with a mental health crisis the likes of which we have never had before because on top of the iceberg of depression, the tsunami of anxiety disorders, suicidal ideation, other problems, post-traumatic features and reactions to the pandemic, we're going to have millions of people whose brains have been rewired so that they become defiant, antisocial, labile, dysregulated and potentially dangerous [1].

Article Outline

This article is divided into three parts. The first part is a review of the effects on the brain and on the central nervous system. The second part reminds of what previous diseases such as syphilis and traumatic blunt-force brain injury do to the personality of the patients. In the third part, we compare the effects and manifestations of covid-19 in the brains of patients with the brains of psychopaths (antisocial personality disorder) and the brains of borderlines (borderline personality disorder) [2].

Professor of Clinical Psychology in CIAPS (Commonwealth Institute of Advanced and Professional Studies), Cambridge, UK.

Corresponding author: Sam Vaknin, Professor of Clinical Psychology in CIAPS (Commonwealth Institute of Advanced and Professional Studies), Cambridge, UK, E-mail: vakninsam@ciaps.org

Received: December 02, 2025, Accepted: December 09, 2025, Published: December 23, 2025

Covid-19 as neurocerebral illness

The main thesis of this article is well substantiated: the brains of psychopaths and the brains of borderlines are almost indistinguishable from the brains of people who had suffered covid-19, especially if the disease and its symptoms have been severe [3].

Alarmingly, these changes to the brain, cerebrospinal fluid, and central nervous system occur in asymptomatic patients but also in patients with mild symptoms. Covid-19, also a disease of the central nervous system and it induces irreversible changes in personality and sometimes these changes amount to the equivalent of a personality disorder. We also know that, as opposed to trauma or injury, the changes the disease induces are irreversible. The virus seems to be neurotropic and it leads to polyneuropathy.

The problem is that it's very difficult to disentangle the physiological effects of the virus from its biochemical impacts and from panic or anxiety reactions attendant upon clinical depression, including physiological manifestations.

For example: majority of the covid-19 patients experience excruciating headaches and convulsions. The EEG of covid-19 patients resembles the EEG of patients with epilepsy. Epileptic patients typically exhibit disturbed consciousness, paresthesia, ataxia and paresthesia. But these also manifest in panic disorder. Many people react to a diagnosis of covid-19 with anxiety which in some cases it translates *via* conversion symptoms or somatization to physiological symptoms. Which of these is caused by the virus we have no way of telling.

We know that the virus has several pathways. Despite the fact, it is one of the of the biggest RNA viruses in terms of size, it penetrates efficiently the brain blood barrier, successfully enters the brain, initiate there, process and contaminate most of the neurons.

We find the virus in the brains of patients but we also find it in cerebrospinal fluid, in neurons so it seems that the virus has several ways to enter the central nervous system: first, there is the direct infection injury; then, there is the blood circulation pathway; then, there is a neural pathway; then, there is hypoxia injury; then, there is immune injury; and then, of course, the virus binds to the human angiotensin-converting enzyme the ACE and its receptor site that can be found also in the nervous system in the epithelial tissues. So, the virus homes in on the AC2 in the nervous system.

The nervous system is built in a way that encourages the virus to persist and to stay and not to be expelled once it has succeeded to infiltrate. These biological properties include for example the fact that the nervous system doesn't have major histocompatibility molecules so it is limited in its immune reaction to T-cells. Its immune reaction is very narrow. The fact that the central nervous system aspires to homeostasis and so would be averse to expelling anything, thus attempting to maintain stability. This helps the virus: once it enters, it infiltrates, it integrates with neurons for example, it becomes a part of the tissue.

The neurological effects of the virus are not small and they are not limited. About 43-44 percent of patients with covid-19 display MRI abnormalities which are not artifacts. These abnormalities are easily observable in the medial and temporal lobes which are the areas that regulate cognitive and emotional functions. Viruses were found and had effect in the stem, in the thalamus which regulates sensory input and pain, in the cerebrum where motor functions are regulated and most importantly the virus permeated and infested white matter in the brain, the messaging conduit, the channel between clumps of grey matter. Grey matter communicates *via* white matter and white matter abnormalities are found also in brains of psychopaths and borderlines (people diagnosed

with antisocial and borderline personality disorders, respectively).

Covid-19 impact on personality

Even more worryingly, it seems that the virus hijacks the amygdala which is responsible for anxiety reactions but also for emotional regulation. When the amygdala is hijacked by the virus and its functioning changes, the outcome is emotional dysregulation and mood lability which are reminiscent of the same clinical features in borderline personalities.

In some ways covid-19 patients become very borderline. If you talk to nurses and doctors who have treated covid-19 patients, they describe behaviors and reactions (including motor reactions) such as defiance or disorientation or derealization, depersonalization, dissociative amnesia, emotional ups and downs rollercoaster these are all typical of covid-19 patients but are also the hallmarks of borderline personality disorder [4].

Covid-19 patients suffer the physiological effects of the virus: anosmia, hyposmia, ageusia (loss of smell or taste). Many of them go on to develop toxic encephalopathy (acute necrotizing encephalopathy) and they are disoriented owing to this condition. Of course, these are not typical borderline patients or psychopaths, but the outcomes of the encephalopathy resemble very much borderline and psychopathic behavior and the question is: are these outcomes reversible or not. It would be negative [5].

The virus can induce neuro-inflammation or hyper-inflammation in the brain and the part of a larger phenomenon where the immune system attacks the body itself. It is not a cytokine storm and is more common in older patients. The virus seems to overstimulate the immune system and to render it indiscriminate so that it attacks the very cells in which the virus resides and which virus penetrates and infiltrates and, in the process, destroys the body kills. The patient experiences stroke and encephalitis.

Patients who suffer cerebral neurological damage from covid-19 develop inside the brain processes that resemble very much the abnormal processes in the brains of psychopaths. One of them is severe acute loss of myelin (demyelinating loss). The myelin is the kind of packaging of nerve cells and so covid-19 creates demyelinating lesions and these are also very common in psychopathy.

Over the past two decades, much of the literature concerning the biological basis of borderline personality disorder has shifted to direct visualization of brain structures and functions, using neuroimaging. It seems that we are medicalizing these conditions, re-conceiving borderline personality disorder and psychopathy as brain disorders. We are beginning to consider borderline as a form of secondary psychopathy. It is common knowledge the brain disorders, injuries and traumas are sometimes misdiagnosed as mental health problems but what about run-of-the-mill organic medical conditions like covid-19?

Syphilis provides a fascinating glimpse and reminder into the convoluted world of differential diagnoses, the art of telling one form of illness from another. Syphilis is a venereal, sexually transmitted disease. It has a few stages and it involves unpleasant phenomena, such as lesions and skin eruptions. Syphilis can go dormant (latent) for years or even decades, exactly like HIV and then it suddenly erupts and it affects the brain in a condition known as general paresis [6].

Brain tissue in this syphilitic tertiary stage is gradually destroyed by the tiny organisms that cause syphilis, the spirochetes and this progressive devastation in the brain causes mania, dementia, megalomania (delusions of grandeur) which are utterly indistinguishable from narcissism and paranoia. The thing is that even when the existence of syphilis is suspected, it is difficult to diagnose. Most mental health clinicians are unlikely to try to

rule out or eliminate syphilis. In its tertiary brain-consuming phase it produces symptoms that are easily misdiagnosed as bipolar disorder combined with narcissistic personality disorder or paranoid personality disorder and these are usually the diagnoses given [7,8].

Syphilitic patients in the tertiary stage are often described as brutal, suspicious, delusional, moody, irritable, raging, lacking empathy, grandiose and demanding: a typical profile of a psychopathic or narcissistic abuser [9]. The people whose brain is digested and consumed by syphilis, they are indecisive and absorbed in irrelevant detail one moment and irresponsibly and manically impulsive the next moment, exactly like borderline personality disorder patient. They exhibit disorganized thinking, transient false beliefs, mental rigidity and obsessive-compulsive repetitive behaviors [10].

Fritz Redlich, retired Dean of the Yale Department of Psychiatry, published a book titled: "Hitler-Diagnosis of a Destructive Prophet" in 1998. In the book, he describes the final stages of general neurosyphilis paresis. He says: "signs and symptoms include rapid mental deterioration; psychotic and usually absurdly grandiose behavior". This is an example of a disease process and how it affects the brain irreversibly. Same disease processes are happening with covid-19 and they too, are affecting the brain. We don't know yet if the effects on the central nervous system are reversible or not, time will tell. But if they are not reversible, a clinical picture is emerging in which patients with covid-19 begin to resemble patients with borderline personality disorder and a form of psychopathy.

We realized today that psychopathy is a family of disorders. There is the more benign, milder form known as antisocial personality disorder (the socially functional or high-functioning psychopath). Then there is the primary psychopath, the Robert Hare stereotypical psychopath, the type of psychopath studied by Robert Hare, Babiak and others. This is a psychopath who is defiant, contumacious (abhors authority and authority figures), criminalized, ruthless, callous and reckless. Then there is the secondary psychopath who have empathy and is able to access his or her emotions. Most patients with borderline personality disorder are now being reconceived as secondary psychopaths [11,12].

The clinical neuro imaging picture of the brain of patients with COVID-19 does not tally well with a neuroimaging and functional picture of the brains of primary psychopaths. For example: primary psychopaths have a deficiency of gray matter which is not evident in patients with COVID-19.

Brain traumatic injury and changes in personality

What about blunt-force trauma injury to the brain?

The brain is redundant and highly neuroplastic. The minute a region is damaged, the brain immediately starts the process of rewiring itself, transferring functions from one place to another, sometimes even from one hemisphere to another. We have had cases of people without one hemisphere of the brain and they were still able to function. This flexibility is why people who have experienced abuse and Complex Post-Traumatic Stress Disorder (CPTSD or complex trauma) ultimately recover and heal: the brain creates new pathways, new deposits of biochemicals and forms of memory. It's like getting another brain. So, redundancy and neuroplasticity conspire in a good way to compensate for blunt force trauma and injury. Yet, some changes are irreversible.

Phineas Gage was a 25-year-old construction foreman. He lived in Vermont in the 1860s. While working on a railroad bed, Phineas packed powdered explosives into a hole in the ground, using a tamping iron. The powder heated and blew up in his face. The tamping iron that he was holding rebounded and pierced

the top of his skull, ravaging the frontal lobes. A few years later, in 1868, his doctor, named Harlow, reported the changes to Phineas Gage's personality following the accident.

He wrote: "Phineas became fitful, irreverent, indulging at times in the grossest profanity, which was previously not his customs, manifesting but little deference to his fellows, impatient of restraint or advice when it conflicts with his desires. At times, Phineas is pertinaciously obstinate yet capricious and vacillating, devising many plans for future operation which are no sooner arranged than they are abundant in turn for other plans appearing more feasible. His mind was radically changed so that his friends and acquaintances said he was no longer Phineas Gage". Put differently: Phineas Gage's brain injury had turned him into what we today would call a psychopathic (malignant) narcissist. Similarly startling transformations have been recorded among soldiers with penetrating head injuries suffered in World War One [13,14].

Orbitomedial wounds made some people pseudo psychopathic (that was the term in the literature at that time). Pseudo psychopathic simply meant combination of psychopathy and narcissism: grandiose, euphoric, disinhibited and puerile. When the dorsolateral convexities were damaged, the soldiers affected became lethargic and apathetic and they were described as "pseudo-depressed" [15]. As Norman Geschwind noted, many soldiers had both symptoms. In a studly titled "gray matters abnormalities in patients with narcissistic personality disorder" published in June 2013 in the Journal of Psychiatric Research, the authors conclude the following: "relative to the control, patients with narcissistic personality disorder had smaller gray matter volume in the left anterior insula. Independent of group, gray matter volume in the left anterior insula was positively related to self-reported emotional empathy. Complementary whole brain analysis yielded smaller gray matter volume in frontal paralympic brain regions, comprising the rostral and median cingulate cortex as well as dorsolateral and medial parts of the prefrontal cortex. Here we provide the first empirical evidence for structural abnormalities in frontal paralimbic brain regions of patients with narcissistic personality disorder. The results are discussed in the context own narcissistic personality disorder patients' restricted ability for emotional empathy" [16].

The DSM is clear: the brain injured may acquire traits and behaviors typical of certain personality disorders but should not be diagnosed with these disorders. In the general diagnostic criteria for personality disorders (article F) explicitly cautions: "the enduring pattern of personality disorder is not due to the direct physiological effects of a substance, drug of abuse or medication and is not due to a general medical condition such as head trauma and injury."

Still, there's no disputing that a disease process such as syphilis and brain trauma and injury which have just been described, both yielded such massive changes and alterations to the personality that the patients now can in principle be properly diagnosed with a cluster B (dramatic or erratic) personality disorder (antisocial personality disorder, borderline personality disorder, narcissistic personality disorder) [17].

Covid-19 resemblance to antisocial (psychopathic) personality disorder

Let us revert to Covid-19.

Covid-19 affects various regions and functions of the brain: the stem, the thalamus, the cerebellum and most importantly the temporal lobes and white matter. It dysregulates the amygdala. Let's compare these changes to clinical features in psychopathy and in Borderline Personality Organization (BPD) or borderline pattern specifier. To reiterate: in this article "psychopath" refers mostly to secondary psychopathy and antisocial personality disorder.

Regrettably, most of the neuroimaging studies we have were conducted in prison or in other captive settings where most of the patients suffer from primary psychopathy (the Robert Hare type, not the Cleckley psychopath). Hervey Ckleckly in his seminal tome, the Mask of Sanity (1942), described another type of psychopath (which I call the mischievous psychopath). It is a psychopath that is essentially borderline (dysregulated). Thus, there were two types of investigations conducted on the brains of psychopaths: one involved fMRI, functional MRI (Magnetic Resonance Imaging) and the other kind was conducted with DTI (Diffused Tensor Image) [18,19].

DTI is much more sensitive when it comes to three-dimensioning the brain but is essentially good only for investigating white matter. It is less discerning with grey matter and glia. Functional MRI is good at describing the interactions within the brain, its functioning, *via*, mostly, blood flows but it's not very good at ascertaining structures, especially deep structures like basal ganglia. No technology right now allows us to gain a profound insight into the structure of the brain. But we can do image functionality relatively well.

In primary psychopathy, there is a reduction in prefrontal gray matter volume. This was not observed in covid-19. In psychopathy, there is gray matter loss in the right superior temporal gyrus, volume loss in the amygdala, a decrease in posterior hypocampal volume, an exaggerated structural hypocampal asymmetry, an increase in callosum white matter volume, significantly reduced gray matter volumes in the anterior rostral prefrontal cortex and temporal poles. These are exactly the areas that regulate empathy and the exercise of morality and normativity (adhering to norms, mores, rules and social expectations) [20].

Primary psychopaths, therefore, have a massive deficiency in gray matter everywhere in their brain region not only in one location, especially in areas which are critical to interpersonal and social functioning. But it gets even worse: in psychopaths, there are dramatically reduced connectivity between the ventromedial prefrontal cortex (the part of the brain that is responsible for sentiments such as empathy, guilt and shame) and the amygdala which mediates fear and anxiety. In other words, psychopaths cannot experience fear and anxiety, they are fearless and reckless precisely because their amygdala is not being fed information and signals from the ventromedial prefrontal cortex.

The role of anxiety in psychopathy is now being re-investigated, but not so the long-established absence of fear reactions. Be that as it may, psychopathy is associated with brain abnormalities in the prefrontal temporary limbic circuit, the ridges that are involved, among other functions, in emotional and learning processes. We now conceptualize psychopathy as a brain disorder akin to schizophrenia, bipolar disorders, depression, or psychotic disorders. Malignant narcissism (a comorbidity of narcissism, psychopathy and sadism) may be heading this way as well. It has long been established that borderline personality disorder is a functional brain difference.

In the article titled "a systematic literature review of neuroimaging of psychopathic traits" written by Johanson M et al. and published in Frontiers of Psychiatry in February 2020: "Psychopathy was associated with numerous neuroanatomical abnormalities. Structurally, gray matter anomalies were seen in frontotemporal cerebellar limbic and paralymbic regions. Associated gray measured volume reductions were most pronounced particularly in most of the prefrontal cortex. There were also problems with gray matter volumes of the temporal gyri, including the fusiform gyrus. Also decreased gray matter volume of the amygdalae and hippocampi as well as the cingulate insula cortices and these were associated with psychopathy as well as with an abnormal

morphology of the hippocampi, amygdala and nucleus accumbens. Functionally, psychopathy was associated with a dysfunction of the default mode network which was also linked to poor moral judgment as well as deficient metacognitive and introspective abilities [21].

In second, reduced white matter integrity in the uncinate fasciculus and dorsal cingulum were associated with core psychopathy. In third, emotional detachment was associated with dysfunction of the posterior cerebellum, the human mirror neural system and the theory of mind. All these deficiencies denoted a lack of empathy persistent failure in integrating affective information into cognition".

The conclusions of the study are that "structural and functional aberrancies involving the limbic and paralymbic systems, including reduced integrity of the uncinate fasciculus, appear to be associated with core psychopathic features". Furthermore, this review may suggest that antisocial personality disorder and psychopathy might stem from divergent biological processes.

Covid-19 resemblance to borderline and borderline personality disorders

What about borderline personality disorder?

Quoting from an article, titled "neural correlates of negative emotionality: borderline personality disorders an activation likelihood estimation meta-analysis", by Ruocco et al., published in the Journal of Biological Psychiatry in August 2012: "healthy control subjects activated a well-characterized network of brain regions associated with processing negative emotions and these brain regions include the anterior cingulate cortex and the amygdala. Compared with healthy control subjects, patients with borderline personality disorder demonstrated greater activation within the insula and posterior cingulate cortex. Conversely, borderline patients showed less activation than control subjects in the network of regions that extended from the amygdala to the subgenual anterior cingulate and dorsolateral prefrontal cortex" [22]. This is revolutionary.

We used to believe until recently that the amygdala which regulates emotions such as anxiety and fear in borderline patients is hyperactive and that this is the reason that emotions overwhelm the borderline. Today we know that the amygdala in borderline patients is hypoactive, almost non-reactive. This raises very interesting questions because this is also the clinical picture in psychopathy. So, how come they process emotions so differently? How come the psychopath lacks access to his emotions, is emotionally cold-blooded, like a fish, while the borderline patient is hot-tempered, labile, dysregulated and impulsive? These differences seem to have something to do with other parts of the brain and other functional patterns. It's not the amygdala. As far as these regions are concerned, borderline patients are indeed indistinguishable from secondary psychopaths or covid-19 patients [23,24].

The article concludes: "the processing of negative emotions in borderline personality disorder might be subserved by an abnormal reciprocal relationship between limbic structures representing the degree of subjectively experienced negative emotion and anterior brain regions that support the regulation of emotion. Contrary to early studies, borderline patients showed less activation than control subjects in the amygdala under conditions of negative emotionality". This is the precise neuroimaging picture in psychopaths.

In covid-19 patients, the effects of the virus manifest *via* various pathways: toxins poisoning of the brain; the cytokine storm he attacks by the immune system itself; penetrating the brain blood barrier; and a variety of other ways. Probably what happens is that the virus remains latent, embedded in the brain's deep structures (akin to HCV-1). Once the virus enters it is unlikely to give up its hard-fought gains and exit the brain. Covid-19 patients carry the virus

in their brains for life, disguised to the immune system (which many corona viruses do). It modulates the viral load and acts within the cells *via* RNA and RNA messengering techniques.

It stands to reason that the brain of covid-19 patients, including many asymptomatic patients, harbor the virus in every cell: they come to possess a virus brain which is indistinguishable from the brains of borderline patients and the brains of secondary psychopaths. It's an army of borderline and psychopathic zombies, driven and controlled by the virus, the stuff of horror movies.

Recent conclusions of MRI imaging in borderlines, culled from several articles, especially from an article published in Current Psychiatry in April 2014, supervised by Henry Nasrallah, MD ("borderline personality disorder is a heritable brain disease"): "MRI studies have revealed the following abnormalities in borderline personality disorder brains: hypoplasia of the hippocampus, caudate and dorsolateral prefrontal cortex; variations in the CA-1 region of the hippocampus and subiculum; smaller than normal orbitofrontal cortex and the midtemporal left cingulate gyri" [25]. The differentials are substantial.

The cortex of borderlines is 3/4 the size of a normal cortex: one quarter is missing. The size of the midtemporal left cingulate gyri is similarly smaller. "Larger-than-normal volume of the right inferior parietal cortex and the right parahippocampal gyrus; loss of gray matter in the frontal, temporal and parietal cortices and an enlarged third cerebral ventricle. In women only, reduced size of the medial temporal lobe and amygdala". Until recently, we believed that the amygdala and the medial temporal lobe in borderline women should be hypertrophied and hyperactive. It seems to be atrophied and either hypoactive or hyperactive.

The medial temporal lobe controls the processing of cognitions as they attach to emotions (emotions attached to cognitions). The amygdala processes emotional regulation, including fear and anxiety. In men with borderline, there's a decreased concentration of gray matter in the anterior cingulate which is exactly the clinical picture of primary psychopathy. "Reversal of normal, right greater than left, asymmetry of the orbitofrontal cortex gray matter reflecting a loss of gray matter on the right side; a lower concentration of gray matter in the rostral subgenual anterior cingulate cortex; and a smaller frontal lobe. In an analysis of MRI studies, correlation was found between structural brain abnormalities and specific symptoms of borderline personality disorder, such as impulsivity, suicidality and aggression. These findings may someday guide personalized interventions, for example using neurostimulation techniques such as repetitive transcranial magnetic stimulation and deep brain stimulation to modulate the activity of a given region of the brain, depending on which symptom is most prominent and most disabling". "(Now reviewing fMRI rather than MRI studies) in borderline personality disorder, there's a preponderance of evidence of the following: greater activation of the amygdala and prolonged return to baseline"

The amygdala is hypoactive in borderline, it is less aroused than in healthy normal people but, once it is aroused, it takes longer to return to the baseline. The baseline is lower, but it takes longer for the borderline to return to it. That accounts for the excitatory phase of borderline, when the borderline is "all over the place", dysregulated, labile and aggressive, "hot and cold", rollercoaster, engages in splitting (dichotomous thinking). "Increased functional connectivity in the left frontal cortex and left insula; decrease connectivity in the left cuneus and left inferior parietal and the right middle temporal lobes; marked frontal hypermetabolism in the motor cortex, medial and anterior cingulate and occipital and temporal poles" which, again, is exactly the picture in covid-19 patients.

These patients are agitated, restless, disoriented, dissociative (de-personalized, de-realized) and confused. This chaotic state is expressed *via* motor-sensory functions, the same as with borderlines and with secondary psychopaths. "Lower connectivity between the amygdalae during a neutral stimulus; higher connectivity between the amygdalae during fear stimulus". This is typical of a borderline and is the opposite picture of a primary psychopath. In primary psychopathy, a fear stimulus produces a reduced connectivity in the amygdalae not an increase. This is why primary psychopaths are fearless and reckless. "Deactivation of the opioid system in the left nucleus accumbens, hypothalamus and hippocampus"

This would perhaps explain dissociation: the hippocampus is the repository of long-term memories. A failure to form long-term memories is the core mechanism is alcoholic blackouts, for example. "Hyper activation of the left medial prefrontal cortex during social exclusion, humiliation and rejection". To which I would add also during anticipation of these: when the borderline catastrophizes and imagines social shunning, rejection, abandonment and humiliation. Borderlines also make more mistakes in differentiating between an emotional and a neutral facial expression: they tend to hyper-emotionalize, when they see a neutral face, they tend to attribute an emotion to the neutral face (attribution error). "When we use diffusion tensor imaging on borderlines and we try to ascertain white matter integrity, we show a bilateral decrease in fractional anisotropy in frontal uncinated and occipital frontal fasciculi and a decrease in fractional anisotropy in the genu and rostrum of the corpus callosum and a decrease in interhemispheric connectivity between right and left anterior cingulate cortices."

This picture is largely similar to the immediate damage inflicted by SARS-Cov2 on brain pathways, especially on white matter. The virus removes or destroys the myelin, which is a kind of packaging and isolating substance: it isolates the neuron from the environment. Damage to the myelin engender problems with white matter which are reminiscent to these dysfunctions in BPD.

Another article worth mentioning is titled: "the neurobiology of borderline personality disorder", written by Pier et al., published in Psychiatric Times in March 2016. It says: "over the past decade, much of the literature concerning the biological basis of borderline personality disorder has shifted to direct visualization of brain structure and function using neuroimaging. Most of the findings pertain to brain regions involved in emotional processing, such as the amygdala, insula, posterior cingulate cortex, hippocampus, anterior cingulate cortex and prefrontal regulatory regions. These include the orbital frontal cortex, dorsal-lateral prefrontal cortex and ventral lateral prefrontal cortex.

A meta-analysis of brain volume which comprised 281 people with borderline personality disorder and 293 healthy controls in 19 imaging studies noted left amygdala and right hippocampus grey volume decreases in persons with borderline personality disorder. Volume studies in adolescent onset borderline (the most common form SV) in borderline personality disorder populations also exist but are limited by small sample size, discrepant imaging techniques and highly comorbid presentations. They do not reproduce the volume differences reported in studies of adult borderline." It seems to be a progression in the destruction of gray matter and one would not expect to find the same impact in adolescence as in adulthood. Same, presumably should apply to psychopaths.

In covid-19 patients, there is no destruction of gray matter but the demyelination and the destruction of white matter render gray metal clumps and portions of the brain susceptible to atrophy. It is a "use it or lose it" proposition: as grey matter tracts in the brains of covid-19

patients are unable to communicate with each other because the white matter pathways are destroyed, obviously the gray matter shrinks. "A meta-analysis of functional MRI findings in persons with borderline personality disorder revealed heightened activation during processing of negative emotional stimuli. This activation was in the left amygdala, left hippocampus and posterior cingulate cortex as well as diminished activation in prefrontal regions, including the dorsal lateral prefrontal cortex".

The hyperactivation of the amygdala is from a very low baseline, so, still, compared to healthy people it is hypoactivation. "Another meta-analysis showed heightened activity in the insula and less activation in the subgenual anterior cingulate cortex in persons with borderline and in did not find amygdala hyperactivity". These conflicting findings reflect incompatible definitions of a normal baseline. The baselines of the borderline patient are much lower.

Conclusion

The brains of about half of all COVID-19 patients is affected by the virus SARS-CoV2 which is not only a respiratory or pulmonary virus, but a systemic one: it effects all the systems of the body, including the kidneys, the brain, the heart, blood vessels, the lungs. Wherever there's a human ACE-2 receptor or enzyme, the virus goes. Our body is flooded with these enzymes and receptors: in all epithelial cells, in the intestines, in the kidneys, in the liver, in the brain, the heart. This ubiquity makes SARS-CoV2 a universal systemic virus. A taxonomy the major effects of these virus's centers around the upper respiratory tract through the nose or the mouth to the windpipe, it's preferred location and destination. But, surprisingly, the second most impacted organ is the brain and the central nervous system. Close to half of all people develop an infection of the brain, they're inundated with the virus in their spine and in their brain.

The virus could therefore also be conceived as a neurological virus and the effects in the long term are such that patients with covid-19, recovered patients, asymptomatic patients, patients with severe symptoms and even patients with mild symptoms develop a syndrome of brain dysfunctions and disorders as well as structural abnormalities in the brain that when put together closely resemble borderline personality disorder and secondary (antisocial) psychopathy.

The key question is: are these structural changes and functional alterations permanent, irreversible, here to stay (in which case we have an army of borderlines and psychopaths coming our way or are they symptoms reversible and the brain will recover fully and compensate with neuroplasticity or redundancy?

With long covid still under-studied, it is too early to tell. But the very prospect that these neuro cerebral damages may not be reversible is terrifying. Precedents like syphilis inform us that the devastation in the brain which is caused by disease processes, particularly infectious disease processes, is usually irreversible. People with borderline personality disorder and psychopathy are socially disruptive, even dangerous. If COVID-19 is active, transforming millions into borderlines and psychopaths, humanity is in trouble and needs to prepare to cope with this onslaught. We need to dedicate many more resources to the study of the brains and the central nervous system, the cerebro-spinal tract in covid-19 patients. In autopsies we need to put emphasis on these organs.

Appendix

- Verified neurological symptoms of covid-19
- Virus may be neurotropic and lead to polyneuropathy
- Panic disorder
- Anxiety
- Headaches
- Epilepsy

- Convulsions
- Disturbed consciousness
- Paresthesia
- Ataxia

Pathways

- Direct infection injury
- Blood circulation pathway
- Neuronal pathway
- Hypoxia injury
- Immune injury
- hACE2 (human angiotensin converting enzyme)
- Structural biological properties (lack of major histocompatibility antigens, homeostasis)

Neurological

- 43-44% MRI abnormalities in medial and temporal lobes (cognitive, emotional functions)
- Effects on stem, thalami (sensa, pain), cerebellum (motor), white matter (messaging to grey matter)
- Amygdala hijack (emotional dysregulation)
- Anosmia and hyposmia
- Angeusia
- Toxic encephalopathy ANE (Acute Necrotizing Encephalopathy)
- Disorientation
- Neuroinflammation or hyperinflammation (cytokine storm)
- Stroke
- Encephalitis
- Severe acute demyelinating lesions

References

1. Horowitz MJ. Sliding meanings: a defense against threat in narcissistic personalities. Int J Psychoanal Psychother. 1975;4:167-80.
2. Fairbairn WR. An object-Relations Theory of the Personality. Basic Books Inc. New York, USA. 1954.
3. Jacobson E. The Self and the Object World. International Universities Press. New York, USA. 1964.
4. Vaknin S. Malignant Self-love: Narcissism Revisited (10th Revised Impression). Narcissus Publications, Republic of Macedonia, Greece. 2015.
5. Greenberg J, Mitchell SA. Object relations in psychoanalytic theory. Harvard University Press, Massachusetts, USA. 1983.
6. Freud S. Three Essays on the Theory of Sexuality. Verso Books, New York, USA. 2017.
7. Sovine DL. Disorders of Narcissism: Diagnostic, Clinical, and Empirical Implications. American Psychiatric Press, Washington, DC, USA.1998.
8. Alford CF. Narcissism: Socrates, the Frankfurt School, and Psychoanalytic Theory. Yale University Press, London, England. 1988.
9. Grunberger B. Narcissism: Psychoanalytic Essays. International Universities Press, New York, USA. 1979.
10. Kernberg O. Borderline Conditions and Pathological Narcissism. Jason Aronson Publisher, New York, USA. 1975.
11. Rothstein A. The Narcissistic Pursuit of Reflection. International Universities Press. New York, USA. 1984.
12. Schwartz L. Narcissistic personality disorders-a clinical discussion. J Am Psychoanal Assoc. 1974;22:292-306.
13. Freud S. On narcissism. In: Rivkin J, Ryan M (eds). Literary Theory: An Anthology (2ndedn). Blackwell Publishing. Maiden, USA. 1914;pp.415-7.
14. Golomb E. Trapped in the Mirror: Adult Children of Narcissists in their Struggle for Self (1stedn). William Morrow & Company, Inc., New York, USA. 1992.

15. Ronningstam E. Pathological narcissism and narcissistic personality disorder in axis I disorders. Harv Rev Psychiatry. 1996;3:326-40.

16. Schulze L, Dziobek I, Vater A, et al. Gray matter abnormalities in patients with narcissistic personality disorder. J Psychiatr Res. 2013;47:1363-9.

17. Stormberg D, Ronningstam E, Gunderson J, et al. Brief communication: pathological narcissism in bipolar disorder patients. J Personal Disord. 1998;12:179-85.

18. Millon T, Davis RO. Disorders of Personality: DSM-IV and Beyond (2ndedn). John Wiley and Sons, New York, USA. 1996.

19. Millon T, Millon CM, Meagher SE, et al. Personality Disorders in Modern Life (2ndedn). John Wiley and Sons, New York, USA. 2012.

20. Guntrip H. Personality Structure and Human Interaction. International Universities Press. New York, USA. 1961.

21. Johanson M, Vaurio O, Tiihonen J, et al. A systematic literature review of neuroimaging of psychopathic traits. Front Psychiatry. 2020;10:1027.

22. Ruocco AC, Amirthavasagam S, Choi-Kain LW, et al. Neural correlates of negative emotionality in borderline personality disorder: an activation-likelihood-estimation meta-analysis. Biol Psychiatry. 2013;73:153-60.

23. Lasch C. The culture of narcissism. In: Wilkinson R (eds). American social character. Warner Books, New York, USA. 2019;pp.241-67.

24. Lowen A. Narcissism: Denial of the True Self. Touchstone Books-Simon and Schuster, New York, USA. 1997.

25. Nasrallah HA. Borderline personality disorder is a heritable brain disease. Curr Psychiatry. 2014;13:19.