A Mind-Body Exploration of HIV/AIDS & Mental Health

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Psyc 358

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October 22, 2019

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In studies carried out on individuals with human immunodeficiency viruses (HIV) and acquired immunodeficiency syndrome (AIDS), immune system degradation is a primary concern. There is a particular concern surrounding the ratio of the cluster of differentiation 4 (CD4+) T lymphocytes to the cluster of differentiation 8 (CD8+) T lymphocytes (Dalmida, 2006). With a significant increase (2-7-fold) of HIV positive (HIV+) persons meeting the diagnostic criteria for Major Depressive Disorder (MDD), MDD becomes one of the most common psychiatric diagnoses associated with an HIV infection (Arseniou, Aikaterini, & Samakouri, 2014). Thus, it becomes relevant to explore mind-body relationships in health for persons with or at risk for HIV infection and explore mind-body influences on the immune system. A mind-body examination may provide alternative perspectives on how enhancing mental health capacity could improve treatment and health outcomes.

Major Depressive Disorder & Immunology

To understand the implications of depression on the immune system of persons who are HIV+, an evaluation of potential relationships between MDD and HIV/AIDS is worth exploration. One of the first theories of depression and HIV+ status is that MDD forms as a complication of the disease's neurodegenerative progression. HIV-associated mild neurocognitive disorder and HIV-associated dementia would be such examples (Arseniou, Aikaterini, & Samakouri, 2014). Depression, as a DSM-V diagnosis, is separate from the perceptual changes in cognitive functioning caused by the neurodegenerative impairments caused by HIV. The differences between the diagnosis of depression and HIV related neurodegeneration can be discerned through an electroencephalogram (EEG) (Arseniou, Aikaterini, & Samakouri, 2014). The distinction between neurodegeneration and depression

opens up the potential of health outcomes as a result of psychologically therapeutic interventions, which will be discussed later.

One pathway implicated in the health of HIV+ persons is the HPA-axis. Noted by Flett, Kocovski, and Blankstein (2017), prolonged activation of the HPA-axis decreases the resiliency of the autoimmune system. After the development of highly active antiretroviral therapy (HAART), research on the impacts of MDD on HIV disease progression became increasingly studied. Subsequent findings from the research were that the CD8+ to CD4+ ratio increased and that HAART treatments for persons with MDD could not restore their natural killer cell levels. The presence of MDD may effectively then compound the immune system imbalance present in HIV/AIDS, contributing to the reduction of the body's ability to identify/attack antigens (decreased CD4+ cells), while having an increased number of CD8+ cells to kill the infected or damaged cells (Shier, Butler, & Lewis, 2007; Leserman, 2008). HIV combined with MDD has thus been considered highly correlated with a higher viral load and quicker progression from HIV to AIDS (Arseniou, Aikaterini, & Samakouri, 2014).

Mind-Body Pathways

HIV Treatments & Mental Health

One of the unfortunate correlations that emerged from the literature were the impacts of Efavirenz, utilized as a HAART in first-line treatment for HIV+ patients. Research of its concentration in plasma that exceeds 2.75 μg/ml had increased risks of suicidal ideation and depressive symptoms. Concentrations in excess can lead to toxicity within the CNS, which can further exacerbate depression, while having further negative impacts on the central nervous system. Replacement of Efavirenz with an alternative HAART, Nevirapine, showed an

improvement in mental health and symptoms within three months of switching medications (Riverea-Rivera, Vázquez-Santiago, Albino, & Rivera-Amill, 2016).

A concern that arises from the symptomology of depression is the adherence to HAART therapies. Because HIV is a chronic health concern, prolonged MDD that emerges once diagnosed with HIV+ may provide a barrier to medication adherence. Hippocampal shrinkage associated with depression can be associated with short-term memory deficits, which could have a consequential impact on health outcomes (Carlson & Heath, 2010; Flett, Kocovski, & Blankstein, 2017). Rivera-Rivera et al. (2016) suggest that impacted memory may harm adherence to the HAART regimen by up to the times compared to non-depressed HIV+ persons. Should medication adherence rates drop below 95%, optimal virus suppression will not be achieved, leading to a quicker progression from HIV to AIDS.

Biopsychological Health & the HPA-Axis

Interestingly, similar to the impacts of MDD on HIV progression, the activation of the HPA-axis and the extended and elevated release of the hormone cortisol, has also been implicated in the faster progression of HIV to AIDS (Arseniou, Aikaterini, & Samakouri, 2014; Cole, 2008). Prolonged cortisol exposure is associated with increased plasma levels of catecholamines that are believed to be a response to psychological stress and depression (Arseniou, Aikaterini, & Samakouri, 2014). Scholars such as Lanius, Vermetten, and Pain (2010) also note that the abnormal activation of the HPA-axis can also have negative implications in the domain of mental health. As such, they suggest that prolonged cortisol exposure is associated with the development of post-traumatic stress disorder, panic disorder, generalized anxiety disorder, substance abuse, and major depression. What remains undetermined is if the virus activates the HPA-axis, if the psychosocial environment activates it, or if they mutually interact

to increase activation (Cole, 2008). The only HIV+ literature found to suggest that the psychological domain holds an independent influence over the HPA-axis is studies on bereavement. In earlier studies that predated HAART pharmacotherapy and focused on MSM (men who had sex with men) who had lost a partner to HIV/AIDS. After the loss of a partner, the MSM cohort's CD4+ levels rapidly deteriorated, suggesting that emotional distress remains interconnected with the HPA-axis and wellbeing of systems that mediate immune system function (Leserman, 2008).

Concerning the HPA-axis, the amygdala can increase dopamine in the mesocortical pathway. The increased dopamine can increase the reaction towards mildly negative stimuli (anhedonia) (Tafet & Nemeroff, 2016; Flett, Kocovski, & Blankstein, 2017). Anhedonia is believed to contribute to negative biases in cognitive processing, which would operate along a similar pathway to Beck's developmental model of depression based on anomalous genes (Flett, Kocovski, & Blankstein, 2017). The primary difference would be the absence of the genetic diathesis. The psychosocial stressors and exposure to potential HAARP neurotoxins become the diathesis' in which biological mechanisms combined with the HIV diagnosis provide potential roadblocks to re-establishing mental wellbeing. What becomes a question is if the changes in cognitive processing could form a positive feedback loop (for viral load and subsequent neural & mental health) between the environment, the amygdala, the HPA-axis, immune response, perception, and subsequent health outcomes. If it does, then psychosocial interventions to disrupt the feedback loop would be one mind-body method of intervention.

Catecholamines, Behaviour, Immune Response, & Viral Load

Worth examination is the role catecholamines can play in the contribution to disease progression. Inflammation of dopaminergic structures is common in HIV neurodegeneration

(Nolan, & Gaskill, 2019). The basal ganglia are one of the structures that experiences the most significant impact of inflammation from the virus. Interestingly, dopamine-related gene polymorphisms can impact gene expression in HIV+ persons. One of the genes believed to be involved is the DRD2L gene, which is responsible for creating the proteins used for some of the cell's dopamine receptors (Nolan, & Gaskill, 2019). Changes in the dopamine receptors are believed to be one of the mechanisms in which mental health changes in HIV+ individuals can take place through deteriorating the dopaminergic circuits.

Abnormal dopamine receptors also have implications in the synaptic levels of dopamine along with reuptake mechanisms. These changes within neurons have implications in behaviour, such as increases in drug-seeking and other high-risk behaviours that can spread the virus and have adverse impacts on disease progression (Gelman, Spencer, Holzer, & Soukup, 2006). Should the virus thus exacerbate mental health disorders, such as addictions, the progression of HIV will accelerate regardless of the adherence to a HAART treatment regimen. Both the impacts on the dopaminergic systems and implications for substance use or medication adherence would thus influence the progression of HIV to AIDS (Gelman, Spencer, Holzer, & Soukup, 2006).

Another pathway impacted by neurotransmitters is the immune system, through the immune cells themselves. Examples of cells sensitive to neurotransmitters are myeloid cells and T-lymphocytes. Monocytes, macrophages, microglia, and T-cells also contain the messenger ribonucleic acid (mRNA) that is expressed for all of the dopamine receptor subtypes, along with some adrenergic receptors (Nolan & Gaskill, 2019). Components of the immune system are some of the few cells that can cross the blood-brain barrier. Interestingly, dopamine plays a role in the promotion of viral transcription and chronic infection of T-cells (Nolan & Gaskill, 2019).

These mechanisms may provide insights into how the previously mentioned increased risk for substance abuse could create the conditions a more rapid decline in the CD4+ to CD8+ ratios, along with an increased viral load. In essence, the virus may use cells within the immune system as a "trojan horse" to inadvertently manipulate the neural systems to create a vulnerability towards abnormal behaviour (i.e. addictions) that primes the host conditions needed to enhance virus reproduction. While the ability for immune cells to receive messages through neurotransmitters is not yet fully understood, immunoregulation as a product of the neurochemistry provides another opportunity to examine how mental health, and medical model treatments for mental health, could have an impact on HIV disease progression.

Therapeutic Approaches

What cannot be definitively determined in the literature is if psychotherapeutic interventions can effectively counter an HIV/AIDS diagnosis and subsequent social stigma, mental health, and biological stressors. In research exploring the countering of depressive symptoms, cognitive-based stress management (CBSM) has been explored, showing a decrease in viral load (Antoni et al., 2006). While the CD4+ to CD8+ ratio did not improve, suggesting immune reconstitution did not take place, the immune system did not degrade further. Immune maintenance, however, may be due to increased HAART regimen compliance as a result of the CBSM intervention (Antoni et al., 2006). While blood serum measurements of cortisol were not taken, Antoni et al.'s (2006) conclusion suggested further evaluation of the impacts CBSM had on the HPA-axis, noting the relationship between cortisol and the progression of HIV to AIDS. Regardless of the health pathway, CBSM combined with HAARP had a positive impact over treatment-as-usual with HIV outcomes.

Conclusion

While there are multiple mechanisms by which the HIV and the systems of an individual's body interact, HIV often shares a relationship with MDD and substance use disorders. Psychosocial stress combined with the physiological/medication-associated stresses of HIV/AIDS have a consequential impact on socially accepted behaviour. Literature suggests the pathways involved in the dysregulation of wellbeing are the dopaminergic (mesocortical), the HPA-axis, and the immune system. While mind-body research needs further development, interventions that target perception, the HPA-axis, and cellular neurotransmitters/receptors may provide opportunities to enhance behavioural outcomes that can combat HIV/AIDS. This highlights opportunities for behavioural modifications to have a positive impact on biological health, which could influence future mental health. Implementation of CBSM can have positive impacts in both immune function and medication use. Combined, these factors provide insights regarding the importance of integrating mind-body approach when working with individuals experiencing an illness such as HIV/AIDS.

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