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Continuing Education for Rehabilitation Professionals



PTSD, COVID-19 & and the Injured Worker

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NeuroRestorative's COVID-19 Response

- We are committed to protecting the health and safety of the individuals we serve, our staff, and the community. Our services are considered essential, and we are taking precautions to minimize disruption to services and keep those in our care and our team members safe. In some programs, that has meant innovating our service delivery model through Interactive Telehealth Services. We provide Interactive Telehealth Services throughout the country as an alternative to in-person services. Through Interactive Telehealth Services, we deliver the same high-quality supports as we would in-person, but in an interactive, virtual format that is HIPAA compliant and recognized by most healthcare plans and carriers.
- You can learn more about our COVID-19 prevention and response plan at our Update Center by visiting neurorestorative.com.

Objectives

- Participants will learn and understand Covid 19 recovery process and complications that may occur.
- Participants will learn about the psychological effects, including Post Traumatic Stress.
- Participants will learn about options for assessing this condition with an injured worker.
- Participants will learn about Post Traumatic Stress response with Covid-19 and the injured worker at three levels.
 - Level 1 is the fear of contracting the disease (normal).
 - Level 2 is the level of complications of the disease (family/friends).
 - Level 3 is work related PTSD effects (becoming ill and/or seeing others become ill).

Summary

Now that COVID has been evident for two years, we are beginning to see subtle differences in how COVID may impact any individual. The initial focus on patient well-being was related to pulmonary status leading to secondary neurological and neurocognitive impairment.

However, there may also be **primary neurological changes from COVID** with predictors such as loss of taste and smell suggesting neurological injury.

Further, there is concern about the development of post traumatic stress response following Covid 19 exposure and contracting Covid 19 .

Finally, the pandemic has led to many medical complications ranging from very mild symptoms to death, and has raised the issues of living in **isolation and fear**. *Up to 73.4% of healthcare workers reported post-traumatic stress symptoms during outbreaks with symptoms lasting 1-3 years in 10-40% of those sampled (Preti et al. 2020).*

There are evaluation and treatment options for PTSD with the injured worker.

COVID Health Risks

Signs and Symptoms

COVID Signs and Symptoms

Clinical symptoms (Singhal, 2020)

Acute Symptoms

Fever (not in all), cough, sore throat, headache, fatigue, myalgia (muscle pain) and breathlessness, conjunctivitis

Chronic symptoms

Can progress to pneumonia, respiratory failure, Severe Acute Respiratory Syndrome (SARS), hypoxia/anoxia, neurological impairment (primary or secondary), and death

COVID Signs and Symptoms

Clinical symptoms – Center for Disease Control, 2020

Symptoms may appear 2-14 days after exposure to the virus:

Fever or chills

Cough

Shortness of breath or difficulty breathing

Fatigue

Muscle or body aches

Headache

New loss of taste or smell *

Sore throat

Congestion or runny nose

Nausea or vomiting

Diarrhea

* Neurological signs

COVID Signs and Symptoms

Clinical symptoms – Center for Disease Control, 2020

Emergency warning signs for COVID-19 requiring immediate medical attention:

Trouble breathing

Persistent pain or pressure in the chest

New confusion *

Inability to wake or stay awake *

Bluish lips or face

* Neurological signs (disorientation)

COVID Signs and Symptoms

Clinical symptoms (Singhal, 2020)

Less common symptoms:

Gastrointestinal and inflammatory

Elderly Susceptibility:

Alterations in mental status or blood glucose control

COVID Signs and Symptoms

Medical complications of Covid

Pulmonary disease

Pro-inflammatory cytokine release is known to cause severe pulmonary damage through over activity of the immune system in COVID-19. It is termed “**cytokine storm**”, and likely affects the CNS as well due to the **stimulation of the immune system**. Indirect CNS damage, through cytokine storm, can cause high mortality rates, encephalopathy, and posterior reversible encephalopathy [PRES] (Leonardi et al., 2020).

Lung lesions

Acute lung injury, acute respiratory disease syndrome, shock, and **acute kidney injury** have been noted (Servick, 2020; Singhal, 2020).

Hypoxia has been hypothesized to be a common cause of long-term **cognitive impairment** in patients with acute respiratory distress syndrome (Hall & Fenton, 2020).

Other organ systems

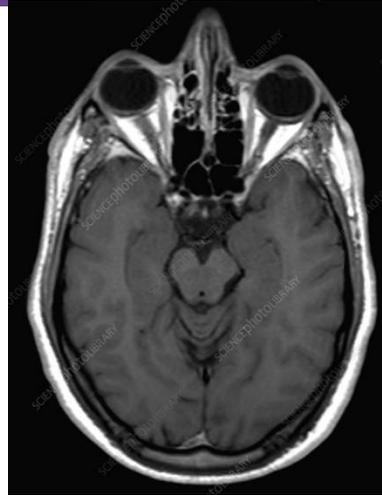
Liver (mild transaminitis), and cardiomyopathy (Servick, 2020).

Brain hemorrhages (Poyiadji et. al., 2020)

COVID Health Risks

Neuropathology

Normal
Brain MRI

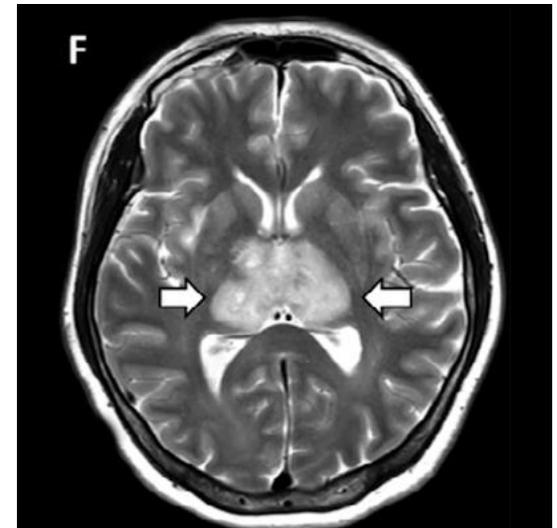


(Poyiadji et. al., 2020);
hemorrhage in temporal
thalamic region

Covid causing
Hemorrhage



Covid Cytokine
Storm



Radiology, 2020; Immune
system damages organs.

Neurological & Neurocognitive Features

COVID Neurological and Neurocognitive

Neurologic complications of Covid

In a retrospective case series from three designated COVID-19 hospitals in Wuhan, China (January 16-February 19 2020, *not peer-reviewed*), 70 out of 214 individuals (36.4%) with lab-confirmed COVID-19 showed neurological manifestations (Mao et al., [2020](#)).

- (a) Central Nervous System (CNS) symptoms (24.8%; headaches, dizziness, impaired consciousness, ataxia, acute cerebrovascular disease such as ischemic stroke or hemorrhage, and seizure),
- (b) Peripheral nervous system (PNS) symptoms (8.9%; hypogeusia [a reduced ability to taste things; the complete lack of taste is referred to as ageusia], hyposmia [reduced or loss of smell], and neuralgia [intense and intermittent pain along the nerve]), and
- (c) Skeletal muscle symptoms (10.7%; myalgia and CK>200 U/L).

COVID Neurological and Neurocognitive

Mental Status

Altered mental status is when a person has difficulty knowing what is happening in the moment with confusion and disorientation. There are many causes of mental status impairments, but mental status changes indicate neurological impairment.

Increasing reports of delirium in covid-19 patients (Leonardi et al., 2020)

22% with delirium died (Chen et al., 2019)

Altered mental status in patients with encephalopathy (Filatov et al., 2020)

COVID Neuropathology

Brain Tissue Changes

Severe cases of COVID-19 are more likely to develop neurological symptoms than patients who have a mild manifestation of infection (White Paper regarding Neurologic Problems associated with COVID-19 Infection).

High number of patients with hyposmia, anosmia and varying patterns of possibly centrally mediated symptoms including respiratory manifestations (Leonardi et al., 2020) have neurological complications otherwise

Plasma biomarkers of CNS damage are increased in patients with COVID-19 and associated with disease severity (Kanberg et al., 2020)

Neurochemistry Changes

Potential to cause nerve damage via diverse pathways (Wu et al., 2020).

Neurochemical evidence of neuronal injury and glial activation in patients with moderate and severe COVID-19 (Kanberg et al., 2020)

COVID Intervention from neurological impairment

Treatment with neurological impairment

For neurocognitive impairment, the focus is on cognitive rehabilitation strategies with speech therapy and neuropsychology, as well as application of skills in real-world settings.

Care levels for treatment following Covid-19:

Hospital acute care,
Inpatient rehabilitation programs,
Post-hospital rehabilitation programs,
Outpatient,
Home & community integration.

Post-hospital care may be more important because of the deconditioning effects of this condition.

COVID Health Risks

Psychological Effects

General Psychological Effects of Covid-19

Increase of suicide potentially related to Covid-19 and stressors associated with the virus (Thakur & Jain, 2020). Social isolation often will produce worry, anxiety and fear, which then leads to feeling hopeless and helpless which then increases the risk of suicide potential. Hopelessness for change and feeling that one is unable to change their situation are the predictors of suicidal ideation.

Significant psychological distress was experienced by hospitalized COVID-19 patients (Guo et al., 2020). The distress can be in the form of typical hospital stress and/or not knowing if one may live through the experience.

Levels of depressive features may be related to the inflammation markers in these patients. There is a strong association of two conditions... **depression due to a medical condition and anxiety due to a medical condition...** with COVID-19 being the medical condition.

Mood is strongly associated with neurological status.

Psychological Effects of Covid-19

Adhering to social distancing guidelines as opposed to doing things like handwashing but not adhering to those guidelines predicted lower coronavirus anxiety (Milman et al., 2020).

The reason is that one is exerting **control over conditions** that feel out of control. If you exert control, then you reduce anxiety because anxiety is about not having control and not knowing the future.

Stress and psychological distress 1 year after experience of non-covid SARs virus (Lee et al., 2007).

Psychological Effects of Covid-19

Covid-19 seems to have a circular relationship with PTSD and immunosuppression where persistent stress related to covid impacts PTSD which impacts immunosuppression leading to increased susceptibility to the virus (Liang et al., 2020).

Research has shown that high stress produces cortisol response in the body. This is the “stress hormone” that is used for flight or fight! PTSD triggers the cortisol. When cortisol levels are elevated and remain elevated, then the immune system becomes compromised, thereby increasing the risk of COVID and many other viruses.

Covid-19 increases psychological stress among the general population and health care workers, increasing demand of mental health interventions (Talevi et al., 2020). Workers not in healthcare but who have higher exposure may also be at risk for increased psychological stresses (e.g., PTSD).

Psychological Effects of Covid-19

COVID-19 patients, when compared to non-COVID controls, manifested higher levels of the following psychological conditions:

Depression ($P < 0.001$),

Anxiety ($P < 0.001$),

Post-traumatic stress symptoms ($P < 0.001$)

(Guo et al., 2020)

Covid-19 is also related to acute stress disorder (Yu et al., 2020).

This disorder can only occur within the first 30 days of the stress occurrence (e.g., when a person becomes aware of the virus and the potentially deadly risk of the condition).



Post Traumatic Stress

Acute & Chronic

Acute Stress Disorder (ASD)



ASD is used from the **time of trauma to 1 month post** as a way to fill the gap of PTSD and facilitate diagnosis and access to health care.

A second major goal of the ASD diagnosis helps **identify people who were at high risk for subsequent PTSD** and could benefit from early intervention, and reduce risk of developing PTSD at all.

ASD requires the individual to experience:

- 1) **Exposure** to actual or threatened death, injury or violation.
- 2) Presence of 9 from the following types of symptoms: **intrusion, dissociative (altered sense), avoidance, and arousal.**
- 3) Duration of **3 days to 1 month** after trauma exposure
- 4) Disturbance is **clinically significant with impairment.**
- 5) Disturbance is **not attributed to other conditions** such as substances, brain injury, and not better accounted for by a brief psychotic disorder.

Post-traumatic Stress Disorder

...Anxiety is the basis...

...but longer than 1 month.

I Definition - Exposure

According to the American Psychiatric Association – DSM-V and the ICD-10 Diagnosis – F43.10

1. Exposure to actual or threatened death, serious injury, or sexual violence.
 - a. Directly experiencing the traumatic event(s).
 - b. Witnessing, in person, the event(s) as it occurred to others.
 - c. Learning that the traumatic event(s) occurred to a close family member or close friend. In cases of actual threatened death of a family member or friend, the event(s) must have been violent or accidental.
 - d. Experiencing repeated or extreme exposure to aversive details of the traumatic event(s) (e.g., first responders collecting human remains; police officers repeatedly exposed to details of child abuse).

I Definition - Exposure

According to the American Psychiatric Association – DSM-V and the ICD-10 Diagnosis – F43.10

2. Presence of one or more intrusion (recurrent thoughts) symptoms associated with the traumatic event(s), **beginning after the traumatic event(s)**.

- a. *Recurrent, involuntary, and intrusive distressing memories of the traumatic event(s).*
- b. *Recurrent distressing dreams in which the content and /or affect of the dream are related to the traumatic event(s).*
- c. *Dissociative reactions (flashbacks) in which the individual feels or acts as if the traumatic event(s) were recurring (most extreme would be loss of awareness of present surroundings).*
- d. *Intense or prolonged psychological distress at exposure to internal or external cues that symbolize or resemble an aspect of the traumatic event(s).*
- e. *Marked physiological reactions to internal or external cues that symbolize or resemble an aspect of the traumatic event(s).*

I Definition - Exposure



According to the American Psychiatric Association – DSM-V and the ICD-10 Diagnosis – F43.10

3. Persistent avoidance of stimuli associated with the traumatic event(s) **beginning after the traumatic event(s)** occurred.

- a. *Avoidance of or efforts to avoid distressing memories, thoughts, or feelings about or closely associated with the traumatic event(s).*

- a. *Avoidance of or efforts to avoid external reminders (people, places, conversations, activities, objects, situations) that arouse distressing memories, thoughts, or feelings about or closely associated with the traumatic event(s).*

I Definition - Exposure

According to the American Psychiatric Association – DSM-V and the ICD-10 Diagnosis – F43.10

4. Negative Alterations in cognitions (memory) and mood (disinterest) associated with the traumatic event(s), beginning or worsening after the traumatic event(s) occurred, as evidenced by two or more of the following:

- a. Inability to remember an important aspect of the traumatic event(s) (typically due to dissociative amnesia and not to other factors such as head injury, alcohol or drugs).
- b. Persistent and exaggerated negative beliefs or expectations about oneself, others, or the world (e.g., I am bad, No one can be trusted, My whole system is ruined).
- c. Persistent, distorted cognitions about the cause or consequences of the traumatic event(s) that lead the individual to blame himself/herself or others.
- d. Persistent negative emotional state (e.g., fear, horror, anger, guilt, or shame).
- e. Markedly diminished interest or participation in significant activities.
- f. Feelings of detachment or estrangement from others.
- g. Persistent inability to experience positive emotions (e.g., inability to experience happiness, satisfaction, or loving feelings).

I Definition - Exposure

According to the American Psychiatric Association – DSM-V and the ICD-10 Diagnosis – F43.10

5. Marked **alteration of arousal** (sleep problems) **and reactivity** (hyper, poor concentration) associated with the traumatic event, beginning or worsening after the traumatic event(s) occurred, as evidenced by two or more of the following:
- a. *Irritable behavior and angry outbursts (with little or no provocation) typically expressed as verbal or physical aggression toward people or objects.*
 - b. *Reckless or self-destructive behavior.*
 - c. *Hypervigilance.*
 - d. *Exaggerated startle response.*
 - e. *Problems with concentration.*
 - f. *Sleep disturbance (difficulty falling or staying asleep or restless sleep)*

I Definition - Exposure

*According to the American Psychiatric Association – DSM-V and the ICD-10
Diagnosis – F43.10*

6. Disturbances have to be longer than 1 month duration.

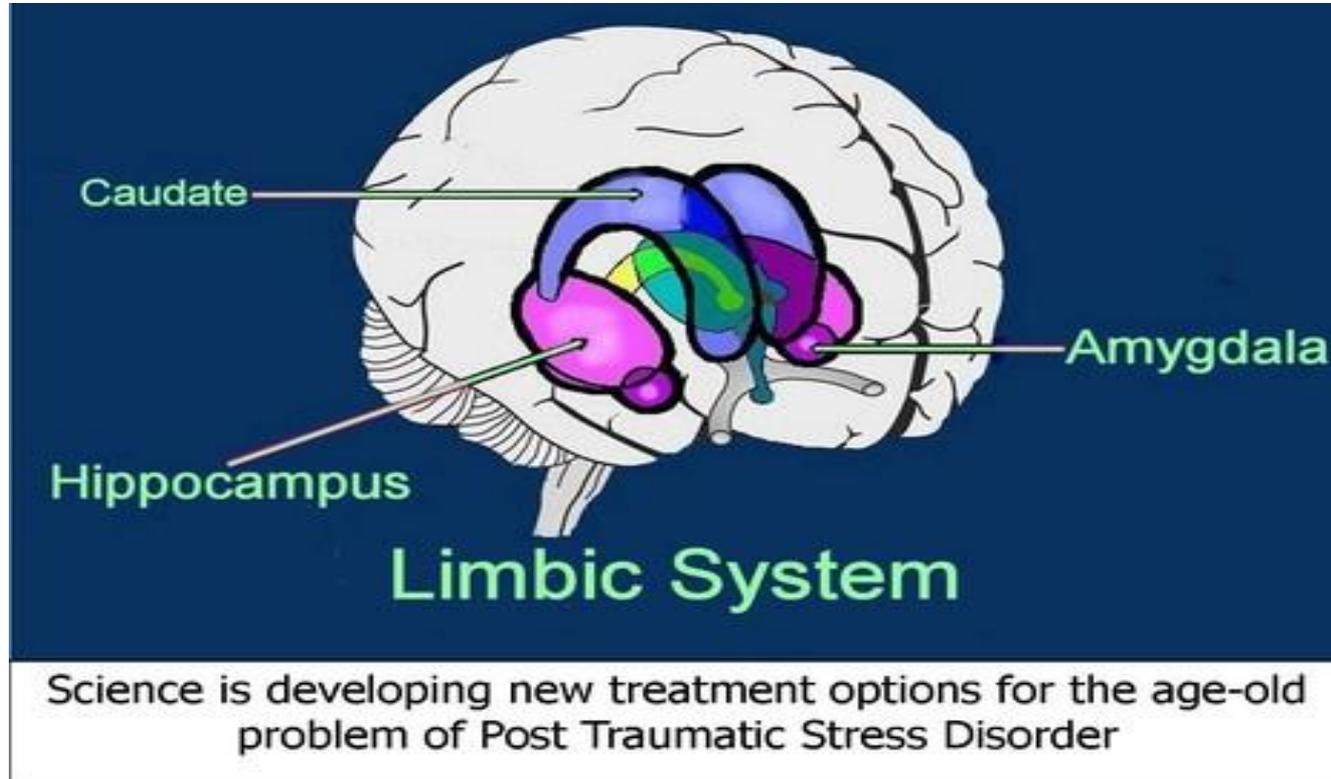
7. Disturbances causes clinically significant distress or impairment in social, occupational, or other important areas of functioning.

8. The disturbance is not attributable to the physiological effects of a substance (e.g., medication, alcohol) or another medical condition.

Post-traumatic Stress Disorder...

...is this a physical condition??

Limbic System Physiology



Hypo-arousal of the Prefrontal Cortex and Hyper-arousal of the Limbic System.

| Evidence for Physical change



Science News: Journal of Nature Neuroscience
Brain tissue yields clues to causes of PTSD (12/2020)
Yale University Researchers

Conclusions:

- The analysis of gene expression patterns in brain tissue located in four regions of the prefrontal cortex revealed distinct differences in those who had been diagnosed with PTSD and those who had not.
- Major differences in gene activity particularly affected two cell types in PTSD patients -- interneurons, which inhibit neural activity, and microglia, immune system cells in the central nervous system.
- Women are more than twice as likely to develop PTSD and other anxiety disorders than men and are likely to experience more severe symptoms.
- Approximately 50% are also diagnosed with some form of depression.

| Evidence for Physical change

Nature Reviews Neuroscience

Biological studies of post-traumatic stress disorder

Conclusions:

- Most well-replicated biological finding in post-traumatic stress disorder (PTSD) is higher autonomic (heart rate and skin conductance) and facial electromyography responding during internal, mental imagery of the traumatic event and upon exposure to external, trauma-related cues.
- Diminished volumes of the hippocampus and anterior cingulate cortex are the most frequently replicated neuroanatomic findings in patients with PTSD.
- Functional neuroimaging studies suggest that the amygdala and dorsal anterior cingulate cortex are hyper(re)active, whereas the ventral medial prefrontal cortex is hypo(re)active, in PTSD. These abnormalities are likely to underlie the attentional bias towards threat, impaired emotion regulation and persistence of fear memories in this disorder.



Post Traumatic Stress

Cases and Assessments

| Cases – Worker’s Compensation



The ability to have a claim varies by state. Covid is new territory as a worker’s compensation claim.

Physical Injury with Psychological Injury – Physical is necessary first

- Covid-19 Exposure

- Covid-19 Infection

- Other physical condition

- Post Traumatic Stress Response

Psychological Injury only – Physical injury is unnecessary

- Post Traumatic Stress Response

Cases – Worker’s Compensation



Case: Long ICU stay (90 days)

Evaluation for Claims

Post Traumatic Stress Assessment

- Detailed Assessment of Post Traumatic Stress
- Personality Assessment Inventory
- Minnesota Multiphasic Personality Inventory II
- Spectra
- Post traumatic checklist (PCL)

Cognitive Assessment

- Brief examination: emphasis on memory and executive functions
- Computerized assessment instruments

Testing Engagement

- Validity
- Reliability
- Motivation

| Cases – Worker’s Compensation



Treatment for Claims

Medical – Covid related complications. May include labs, Brain MRI.

Medical – Rehabilitation as needed or indicated.

Psychological – Individualized therapy based on the symptoms of the individual.

Psychological – Increased coping skills, reducing fear, use of cognitive-behavioral strategies.

Vocational – Return to work emphasis following medical and psychological stability.

- Treat and help the individual return to their work status by problem solving how to manage symptoms and reduce triggers.
- Putting too much pressure at the beginning of treatment for return to work will likely result in not returning to work.
- Psychological readiness is key to successful return!

Three-level consideration for PTSD & Covid

Three levels of experiencing PTSD and Covid-19

Level 1 is the fear of contracting the disease (normal).

Level 2 is the level of complications of the disease

- Seeing others infected (family/friends).

Level 3 is work related PTSD effects

- Becoming ill and/or seeing others become ill – common in healthcare.
- Threat of death; unconsciousness, ICU complications
- Exposure risk prior to the actual infection

| Relax with a Covid-Free Friend.



References

COVID History

COVID-19 Map. (2020). Retrieved July 28, 2020, from <https://coronavirus.jhu.edu/map.html>

Hu R., Jiang Z., Gao H., et al. Recurrent Positive Reverse Transcriptase-Polymerase Chain Reaction Results for Coronavirus Disease in 2019 in Patients Discharged From a Hospital in China. *JAMA Netw Open*. 2020; 3(5): e2010475. Doi: 10.1001/jamanetworkopen.2020.10475

Singhal, T. A Review of Coronavirus Disease-2019 (COVID-19). *Indian J Pediatr* 87, 281–286 (2020). <https://doi.org/10.1007/s12098-020-03263-6>

Sudharsanan, N., Didzun, O., Bärnighausen, T., & Geldsetzer, P. (2020). The Contribution of the Age Distribution of Cases to COVID-19 Case Fatality Across Countries: A 9-Country Demographic Study. *Annals of Internal Medicine*.

Medical Complications

Singhal, T. A Review of Coronavirus Disease-2019 (COVID-19). *Indian J Pediatr* 87, 281–286 (2020). <https://doi.org/10.1007/s12098-020-03263-6>

References

Neurologic Complications

Ando, R. , Kaneko, K. , & Sieg, L. (2020, March 7). Japan's 7-Eleven worker infected with coronavirus: Another case likely caused meningitis. *U.S. News & World Report* .

Bohmwald, K. , Gálvez, N. , Rios, M. , & Kalergis, A. (2018). Neurologic alterations due to respiratory virus infections. *Frontiers in Cellular Neuroscience* , 12(386), 1–15. <https://doi.org/10.3389/fncel.2018.00386>

Courtenay, K., & Perera, B. (2020). Covid-19 and people with intellectual disability: Impacts of a pandemic. *Irish Journal of Psychological Medicine*. <https://doi.org/10.1017/ipm.2020.45>

Desforges, M. , Le Coupanec, A. , Stodola, J. , Meessen-Pinard, M. , & Talbot, P. (2014). Human coronaviruses: Viral and cellular factors involved in neuroinvasiveness and neuropathogenesis. *Virus Research* , 194, 145–158. <https://doi.org/10.1016/j.virusres.2014.09.011>

Filatov A, Sharma P, Hindi F, Espinosa PS *Cureus*. 2020 Mar 21; 12(3):e7352.

Hall & Fenton, 2020 White Paper

Mao, L. , Wang, M. , Chen, S. , He, Q. , Chang, J. , Hong, C. , Zhou, Y. , Wang, D. , Li, Y. , Jin, H. , & Hu, B. (2020). Neurological manifestations of hospitalized patients with COVID-19 in Wuhan, China: A retrospective case series study. *MedRxiv* . Advance online publication. <https://doi.org/10.1101/2020.02.22.20026500>

Principi, N. , Bosis, S. , & Esposito, S. (2010). Effects of coronavirus infections in children. *Emerging Infectious Diseases* , 16(2), 183–188. <https://doi.org/10.3201/eid1602.090469>

Servick, K. (2020). For survivors of severe COVID-19, beating the virus is just the beginning. *Science* , April 8.

References

Neuropathology

Kanberg, N., Ashton, N. J., Andersson, L. M., Yilmaz, A., Lindh, M., Nilsson, S., ... & Gisslén, M. (2020). Neurochemical evidence of astrocytic and neuronal injury commonly found in COVID-19. *Neurology*. DOI: <https://doi.org/10.1212/WNL.0000000000010111>

Leonardi, M., Padovani, A., & McArthur, J. C. (2020). Neurological manifestations associated with COVID-19: a review and a call for action. *Journal of neurology*, 267(6), 1573–1576. <https://doi.org/10.1007/s00415-020-09896-z>

Umapathi T, Kor AC, Venketasubramanian N, Lim CC, Pang BC, Yeo TT, Lee CC, Lim PL, Ponnudurai K, Chuah KL, Tan PH, Tai DY, Ang SP
J Neurol. 2004 Oct; 251(10):1227-31.

Wu, Y. , Xu., X. , Chen, Z. , Duan, J. , Hashimoto, K. , Yang, L. , Liu, C. , & Yang., C. (2020). Nervous system involvement after infection with COVID-19 and other coronaviruses. *Brain Behavior Immunology* . Advance online publication. <https://doi.org/10.1016/j.bii.2020.e.031>

References

Psychological Impact and Distress

Duan, L., Shao, X., Wang, Y., Huang, Y., Miao, J., Yang, X., & Zhu, G. (2020). An investigation of mental health status of children and adolescents in China during the outbreak of COVID-19. *Journal of Affective Disorders*, 275, 112–118. <https://doi.org/10.1016/j.jad.2020.06.029>

Guo, Q., Zheng, Y., Shi, J., Wang, J., Li, G., Li, C., Fromson, J. A., Xu, Y., Liu, X., Xu, H., Zhang, T., Lu, Y., Chen, X., Hu, H., Tang, Y., Yang, S., Zhou, H., Wang, X., Chen, H., ... Yang, Z. (2020). Immediate psychological distress in quarantined patients with COVID-19 and its association with peripheral inflammation: A mixed-method study. *Brain, Behavior, and Immunity*, 88, 17–27. <https://doi.org/10.1016/j.bbi.2020.05.038>

Lee AM, Wong JGWS, McAlonan GM, et al. Stress and psychological distress among SARS survivors 1 year after the outbreak. *Can J Psychiatry*. 2007;52:233-240.

Liang, X., Zhu, Y., & Fang, Y. (2020). COVID-19 and post-traumatic stress disorder: A vicious circle involving immunosuppression. *CNS Neuroscience & Therapeutics*, 26(8), 876–878. <https://doi.org/10.1111/cns.13431>

Milman, E., Lee, S. A., & Neimeyer, R. A. (2020). Social isolation and the mitigation of coronavirus anxiety: The mediating role of meaning. *Death Studies*. <https://doi.org/10.1080/07481187.2020.1775362>

Pitman, R.K., Rasmusson, A.M., Koenen, K.C., Shin, L.M., Orr, S.P., Gilbertson, M.W., Milad, M.R. & Liberzon, I. (2012). Biological studies of post-traumatic stress disorder. *Nature Reviews Neuroscience*, 13, (769-787).

References

Psychological Impact and Distress

Rodriguez, L. M., Litt, D. M., & Stewart, S. H. (2020). Drinking to cope with the pandemic: The unique associations of COVID-19-related perceived threat and psychological distress to drinking behaviors in American men and women. *Addictive Behaviors*, *110*. <https://doi.org/10.1016/j.addbeh.2020.106532>

Talevi, D., Socci, V., Carai, M., Carnaghi, G., Faleri, S., Trebbi, E., Bernardo, A. di, Capelli, F., & Pacitti, F. (2020). Mental health outcomes of the CoViD-19 pandemic. *Rivista Di Psichiatria*, *55*(3), 137–144.

Taylor, S., Landry, C. A., Paluszek, M. M., Fergus, T. A., McKay, D., & Asmundson, G. J. G. (2020). Covid stress syndrome: Concept, structure, and correlates. *Depression and Anxiety*. <https://doi.org/10.1002/da.23071>

Thakur, V., & Jain, A. (2020). COVID 2019-suicides: A global psychological pandemic. *Brain, Behavior, and Immunity*, *88*, 952–953. <https://doi.org/10.1016/j.bbi.2020.04.062>

Ye, Z., Yang, X., Zeng, C., Wang, Y., Shen, Z., Li, X., & Lin, D. (2020). Resilience, social support, and coping as mediators between covid-19-related stressful experiences and acute stress disorder among college students in china. *Applied Psychology: Health and Well-Being*. <https://doi.org/10.1111/aphw.12211>

| Questions

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