

Movement Disorders

All In The Head ?

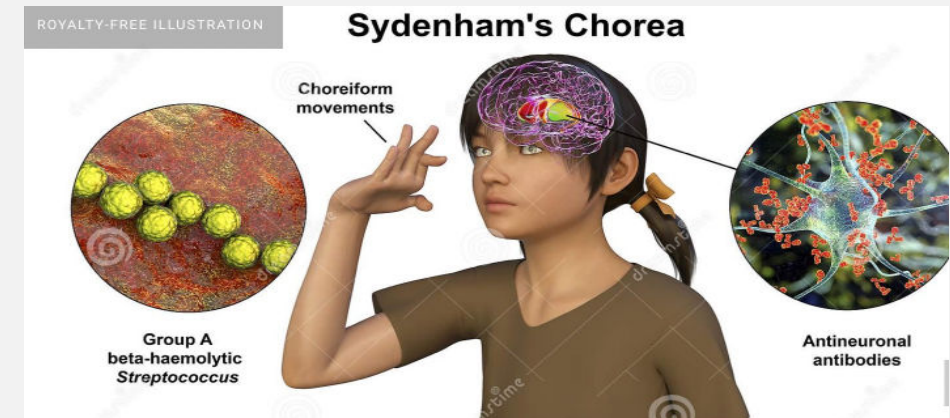
Movement Disorders: A Compulsion to Dance

- Vitus' Dance, back in 1374, groups of people all over Europe - sometimes thousands at a time -- started dancing uncontrollably. It continued for days, and in some cases, weeks and months ?
- It is now called Sydenham's chorea, also known as rheumatic chorea, is a disorder characterized by rapid, uncoordinated jerking movements primarily affecting the face, hands and feet
- Anti-basal ganglia antibodies develop and attack portions of the brain, leading to pathologic findings and symptoms

Saint Vitus and his dance BMJ 2001



Dancing fever ... people affected by St Vitus Dance. Photograph: Alamy Stock Photo



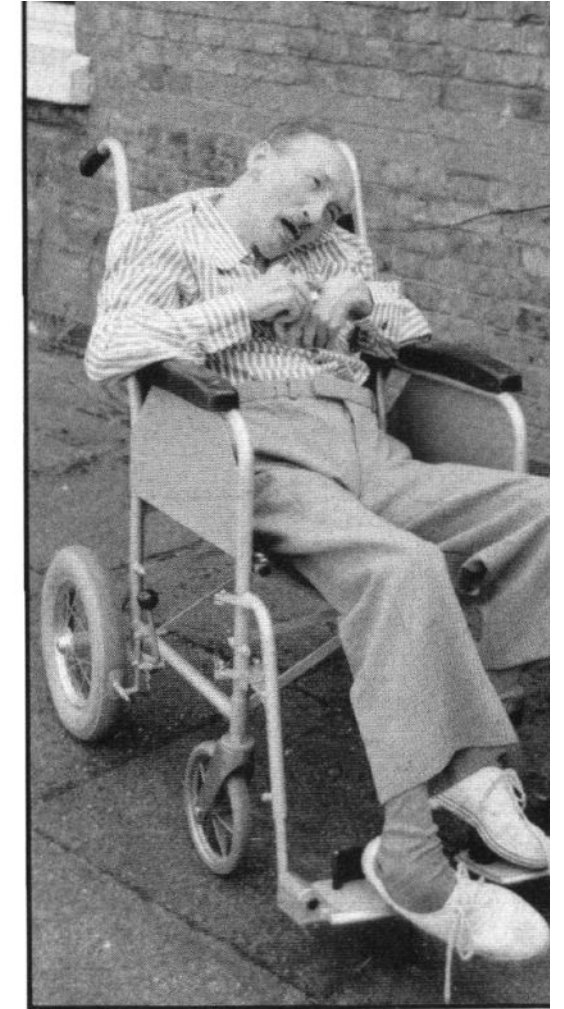
Sydenham's chorea, an autoimmune disease that results from Streptococcus infection, formation of anti-neuronal antibodies damaging brain basal ganglia that cause involuntary movements, 3D illustration

Von Economo's Disease: The Biggest Medical Mystery of the 20th Century

- Between 1917 and 1927, a worldwide epidemic of encephalitis lethargica killed approximately 250,000 persons and left an additional 250,000 with chronic disability.
- Many of the survivors developed parkinsonism, within 4-40 years of the infection (PEP)
- In the acute phase: behavioral, extreme narcolepsy, eye movements bizarre, chorea, dystonia, tics, and myoclonus, all ages but especially children/ young adults
- ? Molecular mimicry / autoimmune / No cases since
- No virus ever found

Encephalitis lethargica: 100 years after the epidemic Hoffman L et al BMJ 2017

Absence of alpha-synuclein pathology in postencephalitic parkinsonism Jellijer K Acta Pharmac 2007



B

Figure 1 — Patient 3. A — photograph published by Purdon Martin⁵ in 1967. B — appearance in 1987.

It is Time... for Another Awakening



There Were Many Neurological Problems after the H1N1 vaccine including Psychogenic Movement Disorders

- Multiple case reports of movement disorders, gait abnormalities, seizures, Bells Palsy, encephalitis, narcolepsy, transverse myelitis, MS, GBS, neuropathy etc
- After mass school vaccinations, 100 kids could not walk (Rye 2010)
- More than 1300 people developed narcolepsy and most were in Finland and Sweden
- The H1N1 influenza nucleoprotein shares molecular mimicry with hypocretin receptors in the hypothalamus
- Narcolepsy was not seen as a post influenza complication

Sleep Problems in Narcolepsy and the Role of Hypocretin/Orexin Deficiency Mignot E et al Basic Science and Role in Sleep Pathology 2022

All vials are not the same: Potential role of vaccine quality in vaccine adverse reactions Yu Y et al Vaccines 2021

Psychogenic movement disorder after H1N1 influenza vaccination Lin C et al Neuropsychiatry Clin Neurosci 2011

Psychogenic Gait Disorders after Mass School Vaccination of Influenza A Rye J J Mov Disord. 2010

HEALTH

A stubborn medical mystery: Was pandemic flu vaccine tied to an increase in narcolepsy cases?



By [Helen Branswell](#) July 5, 2018

[Reprints](#)



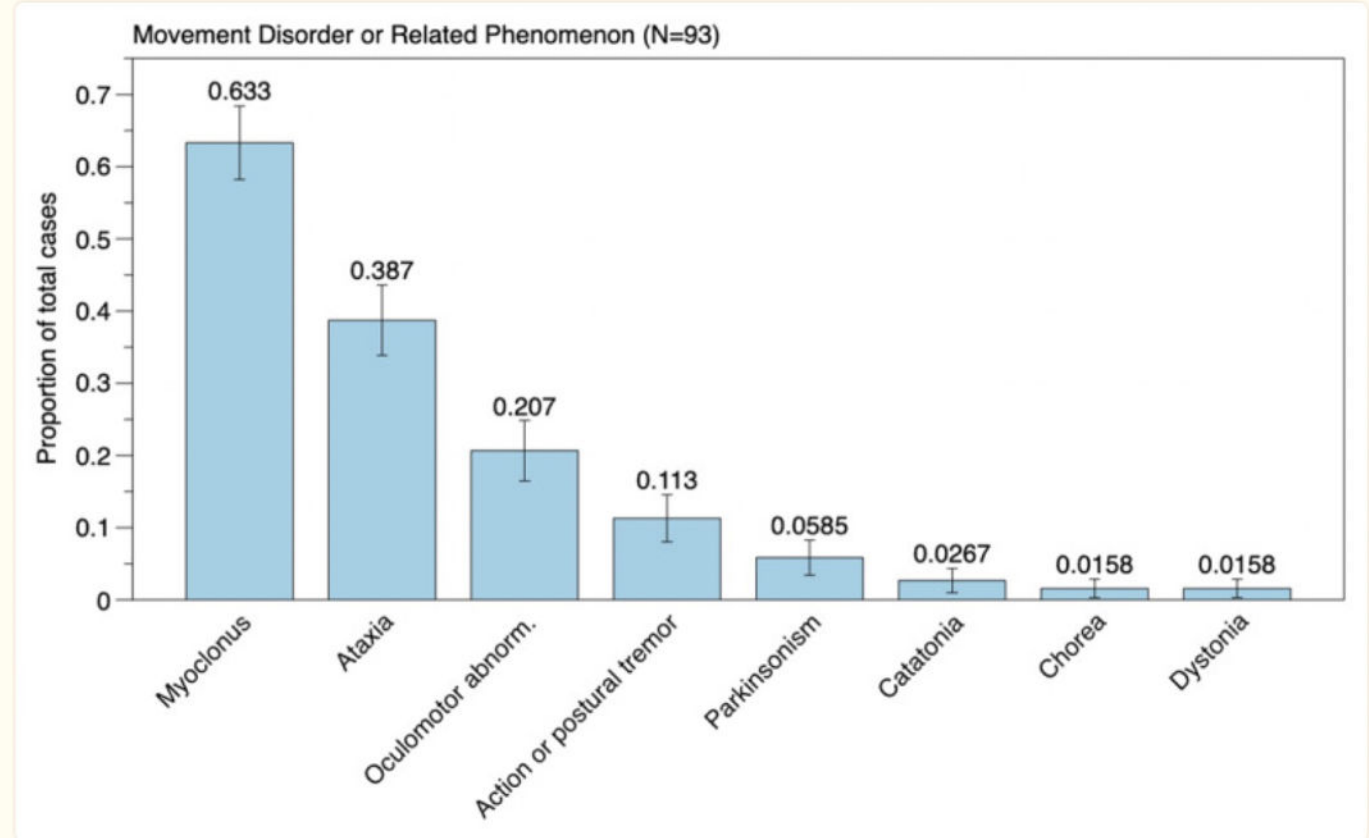
People sit in the waiting room at a Mexico City hospital to be checked for flu-like symptoms during the 2009 flu pandemic.

JOE RAEDLE/GETTY IMAGES

Movement Disorders Post COVID

- New onset movement disorders post COVID

Source New-Onset Movement Disorders Associated with COVID-19 Braundao P et al Tremor Other Hyperkinet Mov (N Y). 2021



[Figure 3](#)

The bar plots' numbers depict the Bayesian binomial posterior proportion of the described movement disorders or associated phenomenology to the total number of described cases ($N = 93$) in the reviewed articles. The error bar reflects the error in the posterior estimates. Data source: extracted from individual patients, original articles.

Movement Disorders after Vaccine: Eu Reporting Data

- Rare?
- Almost 25,000 reported events at end of Dec 2021
- They say frequency of 0.00002-0.0002 based on number of shots and most are FND

Relationship between COVID-19 and movement disorders: A narrative review Schneider S European Neurology Journal Dec 2022

Functional disorders after COVID-19 vaccine fuel vaccination hesitancy Fasano A et al BMJ 2022

Acute Hemichorea-Hemiballismus Following COVID-19 (AZD1222) Vaccination Matar E Movement Disorders 2022

Functional Neurological Disorder After SARS-CoV-2 Vaccines: Two Case Reports and Discussion of Potential Public Health Implications Butler M et al J of Neuropsychiatry 2021

TABLE 2. Frequency and types of movement disorder side effects of selected COVID-19 vaccines reported by EudraVigilance

| Supplier | Pfizer/BioNTech | Moderna | AstraZeneca | Janssen |
|---|-----------------|---------------------|-----------------------------|-------------|
| Name of vaccine | TOZINAMERAN | CX-024414, Spikevax | CHADOX1 NCOV-19, Vakzeveria | AD26.COVS.2 |
| Total doses administered in EU/EEA ^a | 477,960,508 | 66,735,671 | 68,846,754 | 18,051,866 |
| Total number of reported side effects in EU/EEA ^b | 592,779 | 161,667 | 413,987 | 38,686 |
| Total number of reported movement disorders (sum of rows below) | 8259 | 2895 | 13,067 | 627 |
| Frequency of movement disorders among all doses administered | 0.00002 | 0.00004 | 0.0002 | 0.00003 |
| Movement disorders (not specified) | 1081 | 263 | 395 | 58 |
| Parkinsonism | 23 | 2 | 16 | 0 |
| Parkinson disease | 55 | 39 | 30 | 4 |
| MSA | 1 | 0 | 0 | 0 |
| PSP | 3 | 1 | 0 | 0 |
| Cogwheel rigidity | 1 | 1 | 0 | 0 |
| Parkinsonian rest tremor | 1 | 0 | 1 | 0 |

Casey's story

- Casey's story went viral after this interview aired in Dec 2021
- She was injured after her vaccine in September 2021 with the acute onset of numbness, pain, and an atypical movement disorder
- She was called crazy



Movement disorders: What We Are Seeing

- Bilateral upper and lower extremity tremor (with variable frequency and amplitude) L
- Weakness in a non-anatomical distribution and muscle fasciculations
- Gait ataxia (failure of motor coordination)
- Unwanted hyperkinetic or hypo-kinetic movements
- Myoclonus (sudden, brief involuntary twitching or jerking of a muscle or group of muscles)
- Dystonia (sudden abnormal muscle contracture)
- Restless body syndrome / Akathisia
- Choreaform movements (irregular, flowing movements that are sometimes described as “dance-like.”)
- Hemifacial spasm
- Tics (sudden, involuntary movements)
- Abnormal sudden twisting movements of the torso / other body parts / can be painful / sometimes provoked by sensory
- New or worsening PKD
- Things we have NEVER seen before

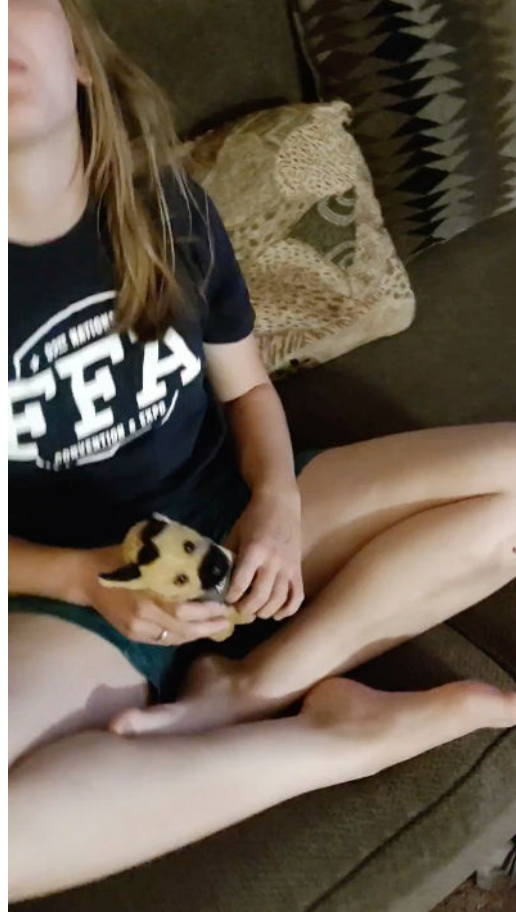
Relationship between COVID-19 and movement disorders: A narrative review Schneider S et al European Journal of Dec 2021

New-Onset Movement Disorders Associated with COVID-19 Braundao P et al Tremor Other Hyperkinet Mov (N Y). 2021;

Transient akathisia after the SARS-Cov-2 vaccine Salinas M et al Clinical Parkinsonism & Related Disorders 2021



Movement Disorder Post Vaccine



Movement Disorders seen With Autoimmune Encephalitis and Autoantibodies

- Neuro-myotonia (stiffness, cramps and twitching for muscles are hyperexcitable)
- Chorea (hyperkinetic purposeless movements)
- Myorhythmia, stereotypies (s repetitive, rhythmic, jerky, slow (1-4 Hz) movement affecting chiefly cranial and limb muscles)
- Myoclonus (sudden, brief and involuntary jerks)
- Dystonia (sustained or intermittent muscle contractions causing abnormal, often repetitive, movements, postures, or both)
- Tremor
- Tics
- Paroxysmal movement disorders
- Painful dystonic spasms
- Parkinsonism (bradykinesia in combination with either rest tremor, rigidity, or both)
- Ataxia (Impaired coordination)
- Stiff-person-like phenomena

Movement disorders in autoimmune encephalitis and paraneoplastic neurological syndromes Honnorat J et al REVUE NEUROLOGIQUE 2018

Movement Disorders: Look to The Children with PANS and PANDAS

- Subacute or Acute onset of sometimes bizarre neuropsychiatric symptoms, various movement disorders, intense and cognitive impairment
- PANS and PANDAS is an infectious triggered autoimmune disease where IgG antibodies from children with PANDAS/PANS bind to cholinergic interneurons in the striatum (basal ganglia)
- Not unusual for the diagnosis to be dismissed

Antibody-related movement disorders – a comprehensive review of phenotype-autoantibody correlations and a guide to testing Govert F et al Neurological Research and Practice (2020)



Antibody Mediated Movement Disorders: Brain On Fire

- Antibody-mediated movement disorders encompass a large clinical spectrum of diverse neurologic disorders occurring either in isolation or accompanying more complex autoimmune encephalopathic diseases
- Spike protein shares molecular mimicry with many different tissues (Vojdani A Jan 2021, Yapici-Eser H 2021)
- Volumes of data show post COVID & post vaccine, patients are at high risk for the development of autoimmune disease and or worsening of their underlying disease due to lingering spike protein (Polykretis P 2023)

Antibody-related movement disorders – a comprehensive review of phenotype-autoantibody correlations and a guide to testing Govert F Neurological Research and Practice (2020)

Neuropsychiatric Symptoms of COVID-19 Explained by SARS-CoV-2 Proteins' Mimicry of Human Protein Interactions Yapici-Eser H et al Front Hum. Neuroscience March 2021



Hyperkinetic Movement Disorder

- Andre was a brilliant young man studying music
- He has a complex hyperkinetic movement disorder
- The most frequently reported hyperkinetic movement disorder related to COVID-19 is myoclonus, chorea, tremor, hyperkinetic movements often occurring in syndromes including ataxia and opsoclonus.

Hyperkinetic Movement Disorder Przytuła F et al
Neurologia i Neurochirurgia Polsk Polish Journal of
Neurology and Neurosurgery 2023

Three Patients With Chorea and Positive Voltage-Gated
Potassium Channel Antibody: Is This the Link Between
Hyperkinetic von Economo Disease and COVID-19?
Dulanto J et al Cureus March 2023

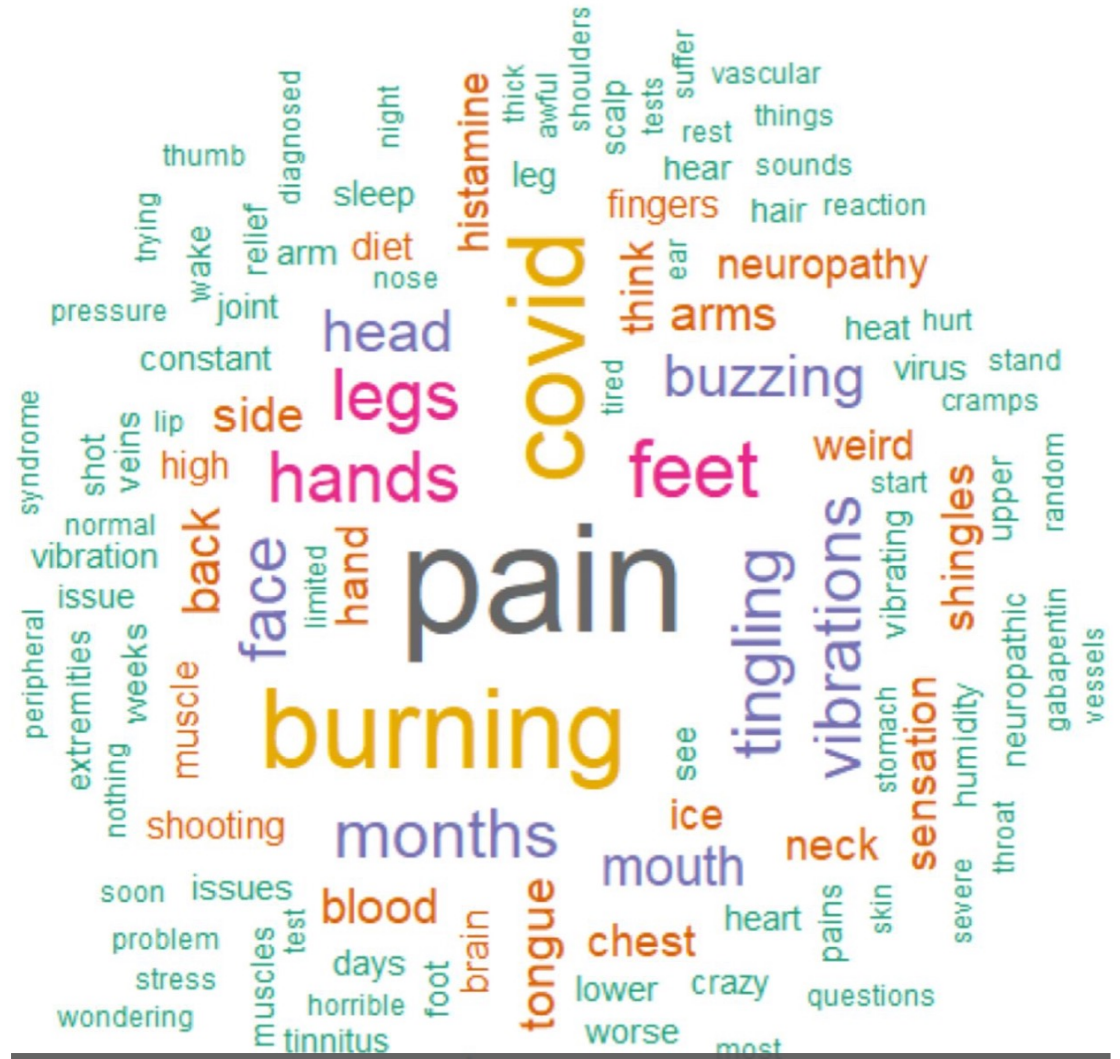


Am I Crazy?

- One study showed that patients after Covid vaccines, exhibit a prolonged and debilitating symptom complex that involves vibrations and tremors
- Spike protein shares molecular mimicry with the nicotinic Ach receptors
- If you block the cholinergic system many downstream effects can occur (cognitive, psychiatric, movement disorders, muscle weakness, fasciculations, muscle cramps)

Internal Tremors and Vibration Symptoms Among People with Post-Acute Sequelae of SARS-CoV-2: A narrative review of patient reports
Preprint 2021

A potential interaction between the SARS-CoV-2 spike protein and nicotinic acetylcholine receptors Sofia A et al Biophys J Mar 2021



Word Cloud generated from Survivor Corps Facebook comments in response to poll related to vibrations, buzzing, and neuropathic pain



Tremor is very
Common



Functional Neurological Disorder: A Dangerous Diagnosis

A Failure of Western Medicine

- According to the DSM-5, FNDs are characterized by one or more neurologic symptoms that show incompatibility with established neurological or medical disorders
- The number of newly referred patients who received a diagnosis of functional movement disorders has increased by 60.1% (Hull M et al 2021)
- The Sleeping Beauties describes hundreds of children of refugee families who have fallen into coma-like states and not woken up again, sometimes for months or years

The onset of functional movement disorders after COVID-19: A case series Rodion S Indian Journal of Psychiatry Sept 2022

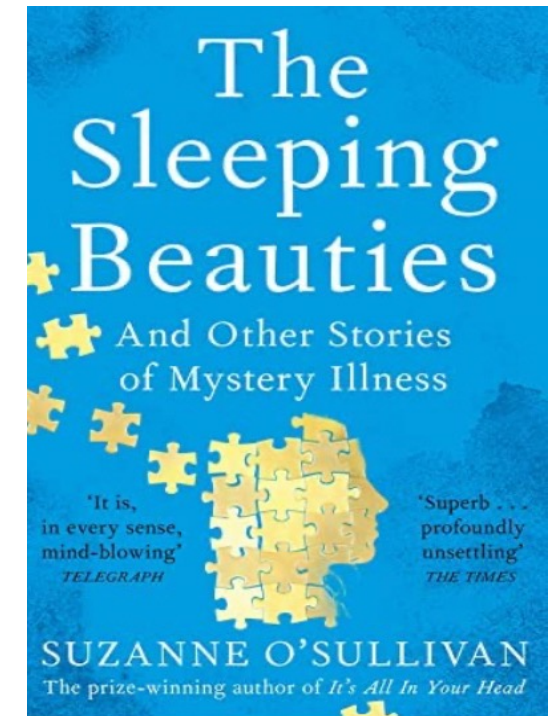
Functional Neurological Disorder After SARS-CoV-2 Vaccines: Two Case Reports and Discussion of Potential Public Health Implications Butler M et al J of Psychiatry and Clinical Neurosciences July 2021

Vaccines and functional neurological disorder: A complex story, say experts Morrison M Mass General 2021

Sleeping sickness, strange behaviour and mass hysteria ... a neurologist makes sense of 'psychosomatic' illness



Children of asylum seekers have become ill when their applications are rejected ... refugees arrive in Düsseldorf, Germany. Photograph: Maja Hitji/EPA



Mass Hysteria or Post COVID movement disorder

- An article in the Atlantic discussed a tremendous rise in tic disorder during lock downs
- Researchers have witnessed a striking, “epidemic” increase in the incidence of first-ever, acute onset tic-like behaviors across Canada, the United States, Europe, and Australia
- Videos shared millions / billions of times in Gen Z
- Move Along , nothing to see here but social media influence

The Atlantic Feb 2022

THE TWITCHING GENERATION

Around the world, doctors have noticed teenage patients reporting the sudden onset of tics. Is this the first illness spread by social media?

FND?

- This patient developed paralysis from the neck down after the first COVID vaccine in Dec 2020
- She was DG with FND
- Her workup proved positive for a positive anti-ganglionic acetylcholine receptor with and atypical Guillain Barre and is improving on IVIG

Anti-ganglionic acetylcholine receptor antibodies in functional neurological symptom disorder/conversion disorder Nagata R
Frontiers Neurology March 2023



The mind is everything. What you think you become.” —Buddha



References

- Grimaldi S, Lagarde S, Harle JR, Boucraut J, Guedj E. Autoimmune encephalitis concomitant with SARS-CoV-2 infection: insight from (18)F-FDG PET imaging and neuronal autoantibodies. J Nucl Med. 2020
- Hull M, Parnes M, Jankovic J. Increased incidence of functional (psychogenic) movement disorders in children and adults amidst the COVID-19 pandemic: a cross-sectional study. Neurol Clin Pract. 2021
- Piscitelli D, Perin C, Tremolizzo L, Peroni F, Cerri CG, Cornaggia CM. Functional movement disorders in a patient with COVID-19. Neurol Sci. 2020
- Piscitelli D, et al Functional movement disorders in a patient with COVID-19. Neurol Sci. (2020)
- Pringsheim T, et al. Rapid onset functional tic-like behaviors in young females during the COVID-19 pandemic. Mov Disord. (2021)
- Proal AD, VanElzakker MB. Long COVID or Post-acute Sequelae of COVID-19 (PASC): an overview of biological factors that may contribute to persistent symptoms. Front Microbiol. (2021) *** autoimmune etiology in myoclonus
- Movement Disorders Induced by SARS-CoV-2 Infection: Protocol for a Scoping Review Rosca E et al J. Clin. Med. 2022,
- Transient akathisia after the SARS-Cov-2 vaccine Salinas M Clinical Parkinsonism & Related Disorders 2021
- Three Patients With Chorea and Positive Voltage-Gated Potassium Channel Antibody: Is This the Link Between Hyperkinetic von Economo Disease and COVID-19? Dulanto J et al Cureus March 2023
- Shishorin R, Gamirova A, Tolmacheva V, Petelin D, Volel B: The onset of functional movement disorders after COVID-19: a case series. Indian J Psychiatry. 2022,

References

- <https://www.suzannegazdamd.com/blog---long-covid/new-onset-autoimmune-issues-post-covid-and-post-vaccine>
- New-onset autoimmune phenomena post-COVID-19 vaccination Chen Y et al Immunology 2022
- Autoimmune Inflammatory Reactions Triggered by the COVID-19 Genetic Vaccines in Terminally Differentiated Tissues Polykretis P et al preprint March 2023
- Autoimmune post-COVID vaccine syndromes: does the spectrum of autoimmune/inflammatory syndrome expand? Jara L et al Clin Rheum 2022
- Three Patients With Chorea and Positive Voltage-Gated Potassium Channel Antibody: Is This the Link Between Hyperkinetic von Economo Disease and COVID-19? Dulanto J et al Cureus March 2023
- Shishorin R, Gamirova A, Tolmacheva V, Petelin D, Volel B: The onset of functional movement disorders after COVID-19: a case series. Indian J Psychiatry. 2022,

References

- Bigman DY, Bobrin BD: Von Economo's disease and postencephalitic parkinsonism responsive to carbidopa and levodopa. Neuropsychiatr Dis Treat. 2018, 14:927-31
- Sturchio A, Dwivedi AK, Gastaldi M, et al.: Movement disorders associated with neuronal antibodies: a data-driven approach. J Neurol. 2022
- Malter MP, Helmstaedter C, Urbach H, Vincent A, Bien CG: Antibodies to glutamic acid decarboxylase define a form of limbic encephalitis. Ann Neurol. 2010,
- Azevedo Kauppila L, Coelho M, Franco AC, et al.: Anti-glutamic acid decarboxylase encephalitis presenting with choreo-dystonic movements and coexisting electrographic seizures. Mov Disord Clin Pract. 2019
- Dickman MS: von Economo encephalitis. Arch Neurol. 2001, 58:1696-8.
- Baumeier C, et al . 2022. Intramyocardial Inflammation after COVID-19 Vaccination
- Schwab C, et al 2022. Autopsy-based histopathological characterization of myocarditis after anti-SARS-CoV-2-vaccination. Clinical Research in Cardiology
- Mörz M. 2022. A Case Report: Multifocal Necrotizing Encephalitis and Myocarditis after BNT162b2 mRNA Vaccination against COVID-19. Vaccines

References

- A nicotinic hypothesis for Covid-19 with preventive and therapeutic implications. Changeux J et al Comptes Rendus. Biol. 2020
- Multisystem Inflammatory Syndrome in Children and Long COVID: The SARS-CoV-2 Viral Superantigen Hypothesis Rivas M et al Frontiers of Immunology July 2022
- What is the impact of nicotine on the Post-COVID-19 syndrome - a severe impairment of acetylcholine- orchestrated neuromodulation: A case series Leitzke M et al Research Square 2022
- Nicotinic Acetylcholine Receptor Involvement in Inflammatory Bowel Disease and Interactions with Gut Microbiota Ruzafa L et al Int J Environ Res Public Health 2021
- Incidence of narcolepsy after H1N1 influenza and vaccinations: Systematic review and meta-analysis. Sarkanen TO et al Sleep Med Rev. 2018
- Neurological complications after H1N1 influenza vaccination: magnetic resonance imaging findings Lessa R Arquivos de Neuro-Psiquiatria 2014
- Neurological complications after first dose of COVID-19 vaccines and SARS-CoV-2 infection Patone M Nature Medicine 2021

Stiff Person and Stiff Person-Like Syndromes

- Stiff-person syndrome (SPS) is characterized by stiffness in trunk and limb muscles, phobic anxiety, and sudden spasms
- SPS happens when the immune system attacks a protein called glutamic acid decarboxylase (GAD), which helps make gamma-aminobutyric acid (GABA) so the inhibitory motor pathways and muscle contraction are impaired
- SARS-CoV-2 proteins interact both directly with receptors of GABA (mainly GABA B) and glutamate (mainly NMDA and metabotropic glutamate receptors)

Postvaccinal GABA-B receptor antibody encephalitis after ChAdOx1 nCoV-19 vaccination Ahn S et al Ann Clin Transl Neurology 2022 Oct



Celine Dion suspends performances due to rare disorder 'stiff person'