Comparative Analysis of Phenotypes: Participants with Long COVID vs. Post-Vaccination Syndrome in the LISTEN study

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Background

Long COVID (LC)

- Numerous studies have characterized long COVID, and published criteria for this condition exist.[1]
- There is a need to determine how published criteria for long COVID performs in a self-selected group of people reporting long COVID.

Post-Vaccination Syndrome (PVS)

- Adverse events following vaccination have been reported by the CDC.[2]
- A less well-characterized adverse event is a chronic syndrome with symptoms that begin soon after vaccination.[3]

References:

1. National Institutes of Health. NIH launches long COVID clinical trials through RECOVER Initiative, opening enrollment. 2023 [updated July 31, 2023. Available from: https://www.nih.gov/news-events/news-releases/nih-launches-long-covid-clinical-trials-through-recover-initiative-opening-enrollment accessed September 10 2023.]
2. Tompkins, L. K., Baggs, J., Myers, T. R., Gee, J. M., Marquez, P. L., Kennedy, S. B., Peake, D., Dua, D., Hause, A. M., Strid, P., Abara, W., Rossetti, R., Shimabukuro, T. T., & Shay, D. K. (2022). Association between history of SARS-CoV-2 infection and severe systemic adverse events after mRNA COVID-19 vaccination among U.S. adults. *Vaccine*, 40(52), 7653–7659. https://doi.org/10.1016/j.vaccine.2022.10.073
3. Couzin-Frankel J, Vogel G. Vaccines may cause rare, Long Covid-like symptoms. *Science*. 2022;375(6579):364-66. doi: 10.1126/science.ada0536 [published Online First: 20220127]

What are the similarities and differences among LISTEN participants with either long COVID or post-vaccination syndrome?

Methods

Definitions

Long COVID (LC)

- Defined by self-reported response to the question “Do you think you have long COVID (symptoms that persist at least 4 weeks after infection)?”

Post-Vaccination Syndrome (PVS)

- Synonymous to vaccine injury (VI)
- Defined by self-reported response to the question “Do you think that you were injured by the vaccine?”

Methods

Bivariate Analysis

- Variables
  - Demographic and socioeconomic details
  - Pre-pandemic comorbidities
  - New-onset conditions
  - Infection characteristics
  - Vaccination history
  - Health status
  - Symptomatology and treatment experiences

Clustering and Machine Learning Model

- gradient-boosted tree machine with 5-fold 5-repeat cross-validation
- K-means clustering

Variables

- symptoms

Results

Results - Demographics, socioeconomic characteristics

Long COVID (LC)

- Median age was 46 years, 74% female, 86% white.

Post-Vaccination Syndrome (PVS)

- Median age is 46 years, 80% female, 87% white.

No significant differences in

- Age, race and ethnicity
- marital status, pre-pandemic employment status, or pre-pandemic household income

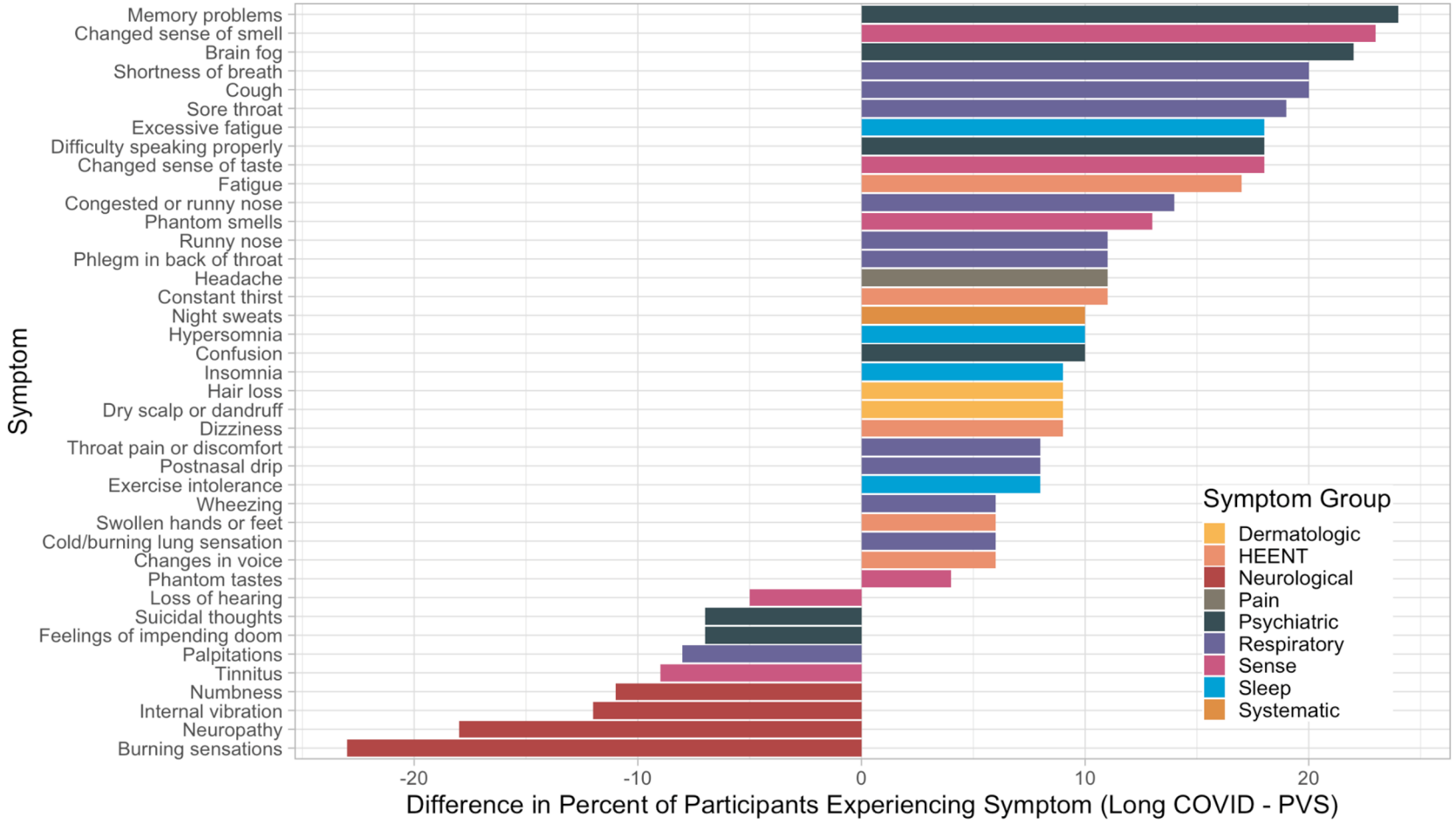
Results

Pre-pandemic comorbidities

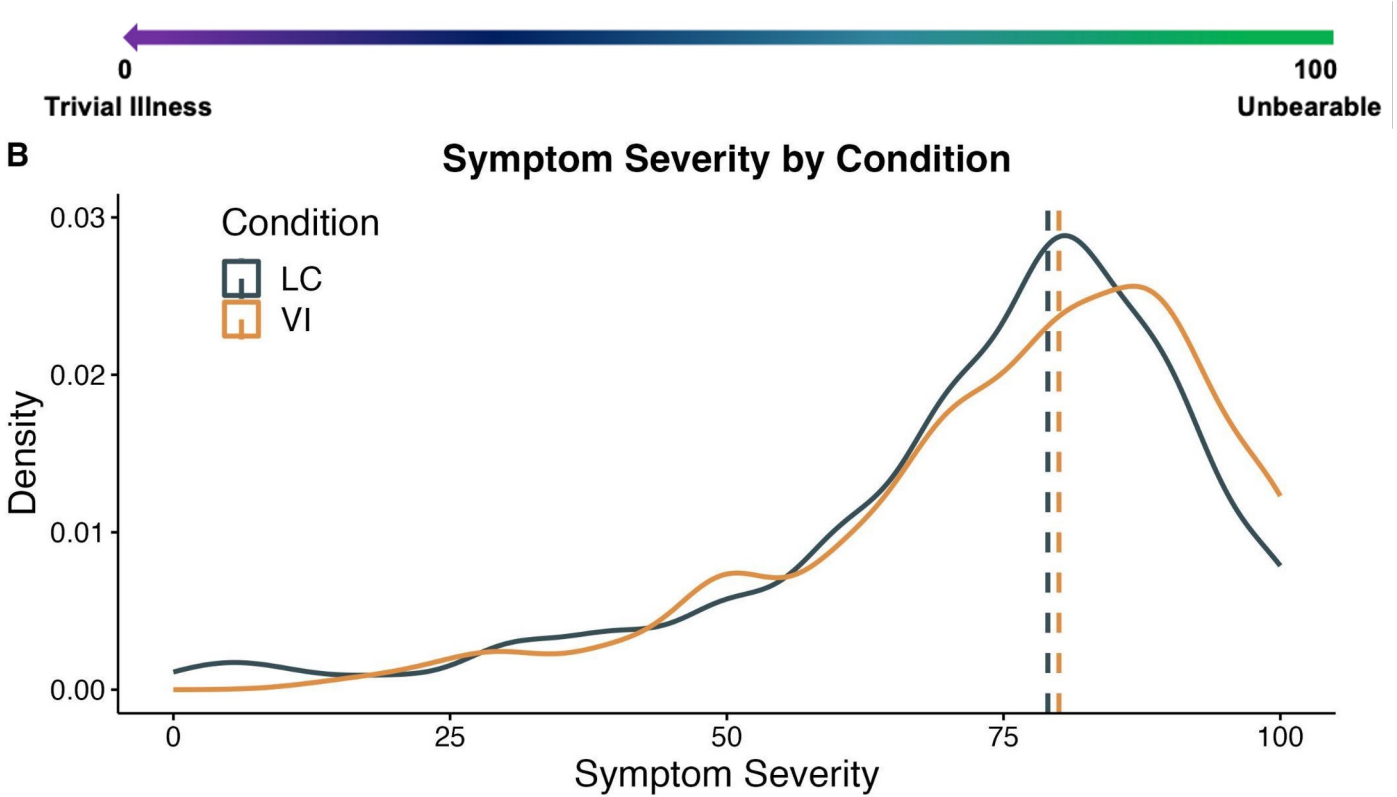
- Participants with long covid were more likely to have chronic lung disease (5% vs 2%) ,ME/CFS (19% vs 12%), depressive disorders (28% vs 20%).
- Participants with PVS were more likely to have cerebrovascular conditions affecting blood vessels to or in the brain (including stroke) (5% vs 2%), MCAS (12% vs 7%), neurological conditions (33% vs 16%).

New-onset conditions

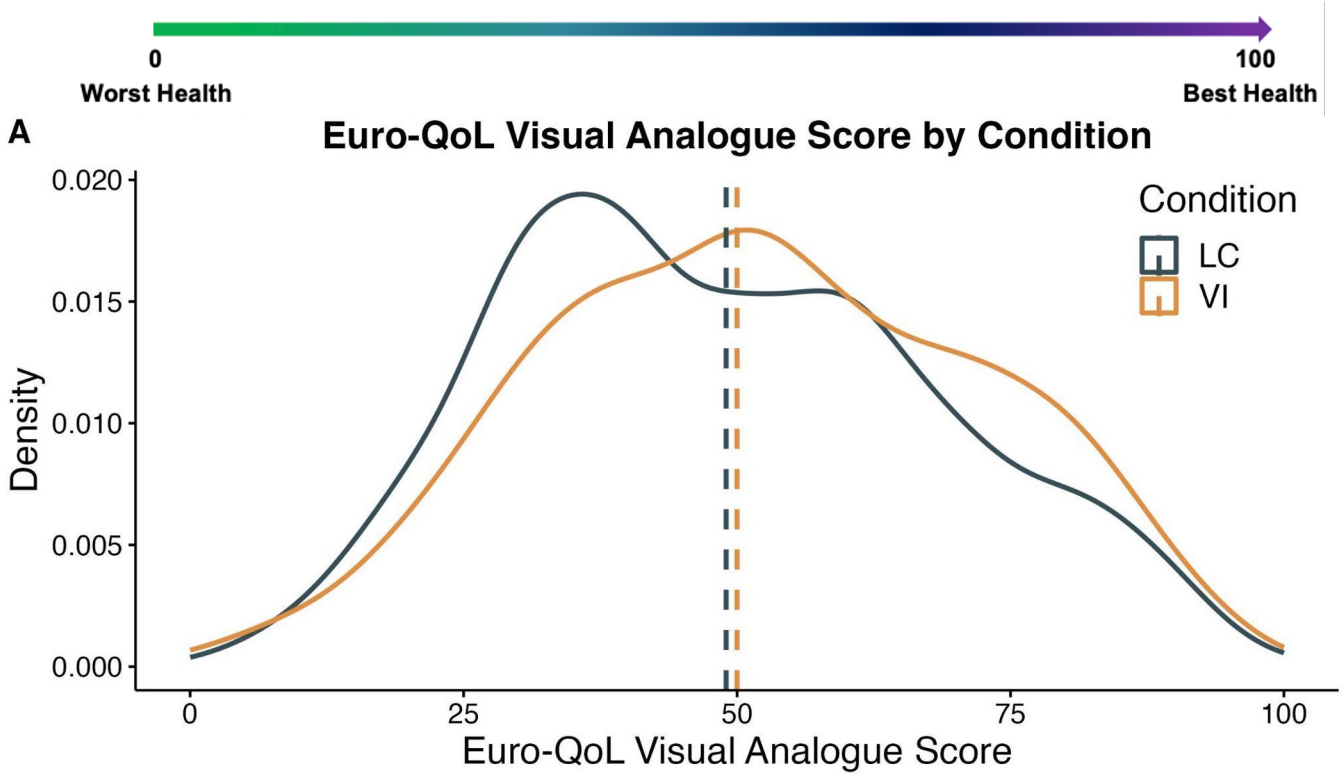
- Participants with long covid were more likely to have: depressive disorders (29% vs 20%), bipolar and related disorders (3% vs. 0.4%).


Memory problems
Changed sense of smell
Brain fog
Shortness of breath
Cough
Sore throat
Excessive fatigue
Difficulty speaking properly
Changed sense of taste
Fatigue
Congested or runny nose
Phantom smells
Runny nose
Phlegm in back of throat
Headache
Constant thirst
Night sweats
Hypersomnia
Confusion
Insomnia
Hair loss
Dry scalp or dandruff
Dizziness
Throat pain or discomfort
Postnasal drip
Exercise intolerance
Wheezing
Swollen hands or feet
Cold/burning lung sensation
Changes in voice
Phantom tastes
Loss of hearing
Suicidal thoughts
Feelings of impending doom
Palpitations
Tinnitus
Numbness
Internal vibration
Neuropathy
Burning sensations
Symptom
-20
-10
0
10
20
Difference in Percent of Participants Experiencing Symptom (Long COVID - PVS)
Symptom Group
Dermatologic
HEENT
Neurological
Pain
Psychiatric
Respiratory
Sense
Sleep
Systematic

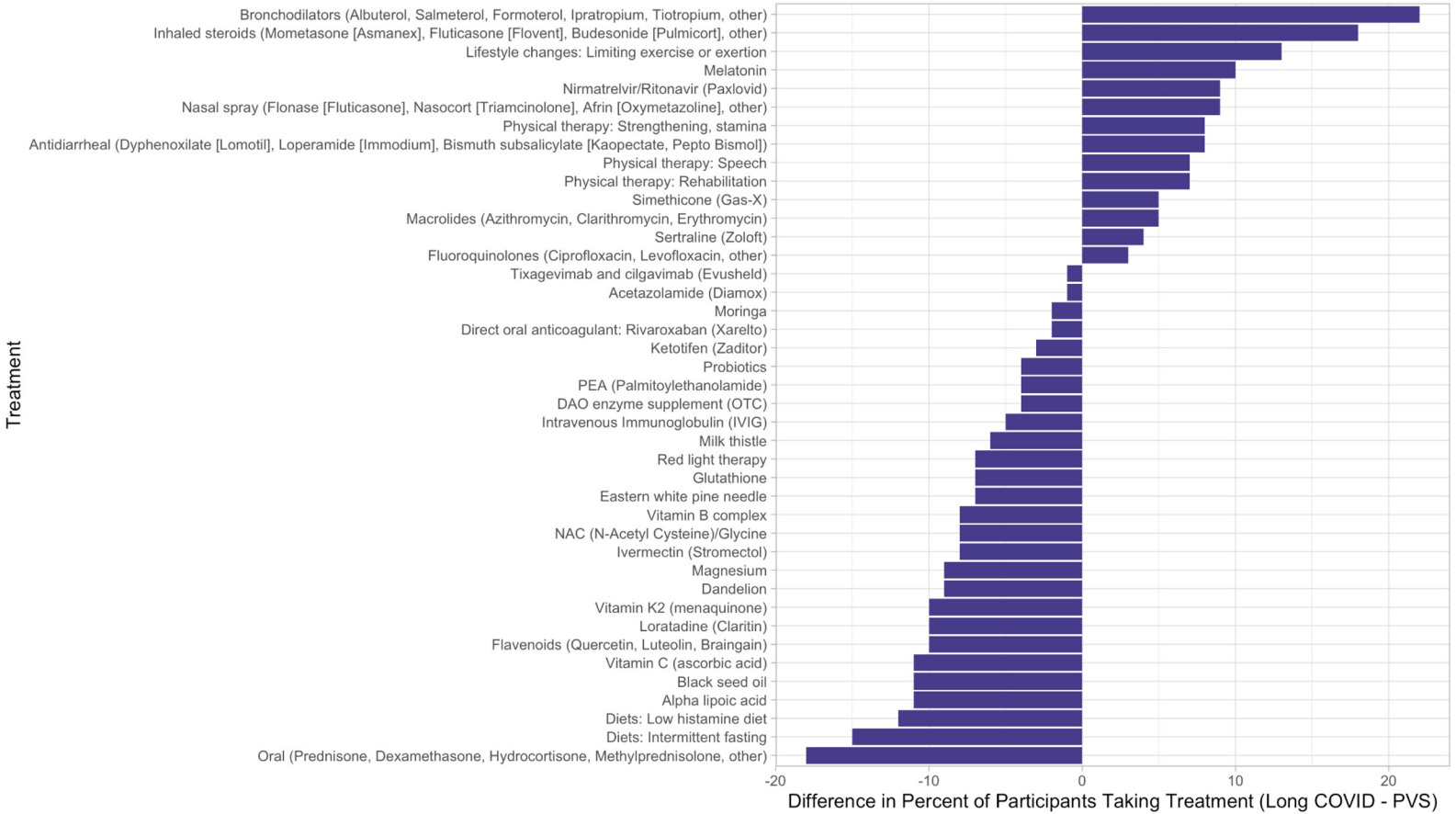
Results – Symptom Severity



Results - Health status



Treatments



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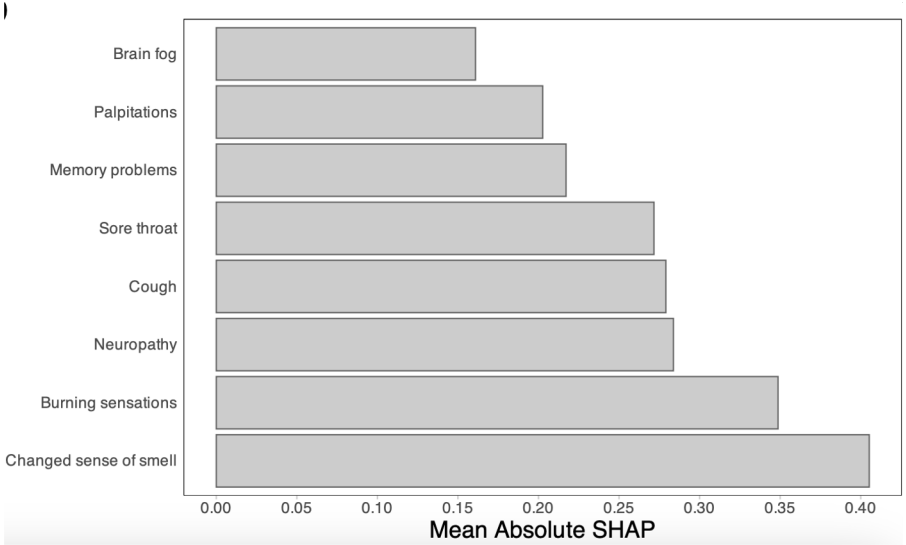
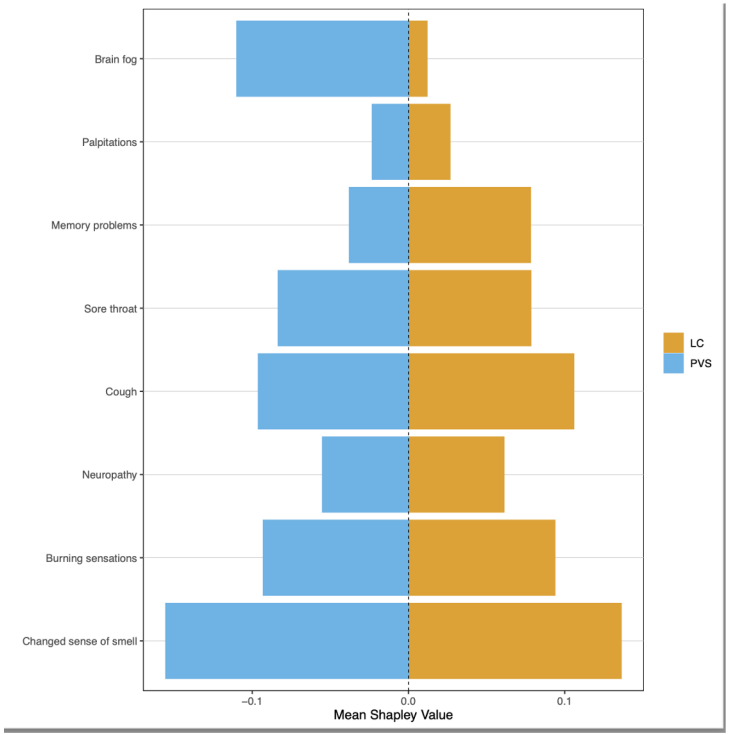
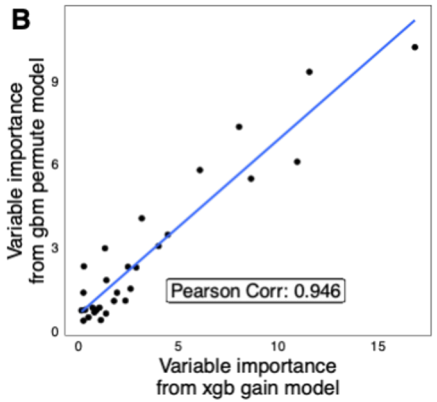
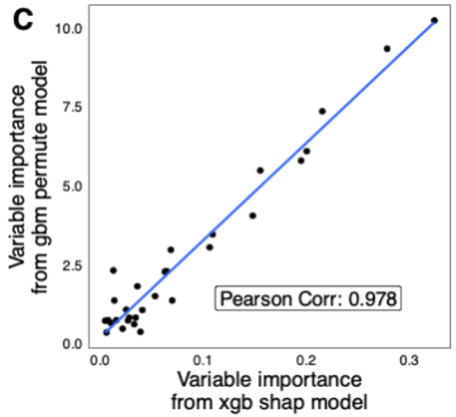
Differentiating LC from PVS Participants With a Machine Learning Model

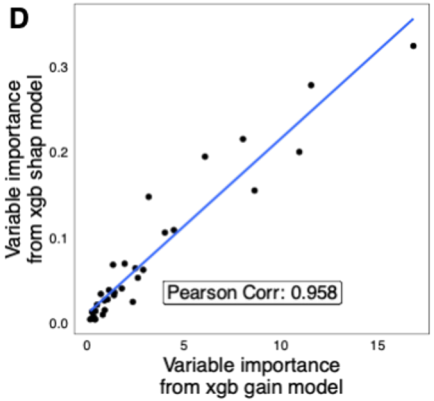


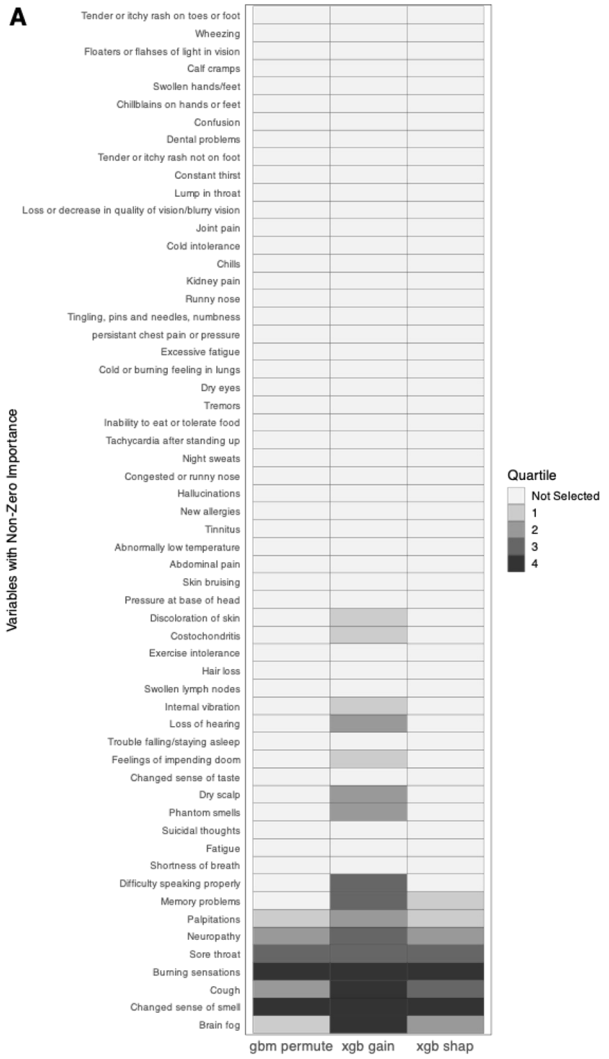


Comparing ML Models

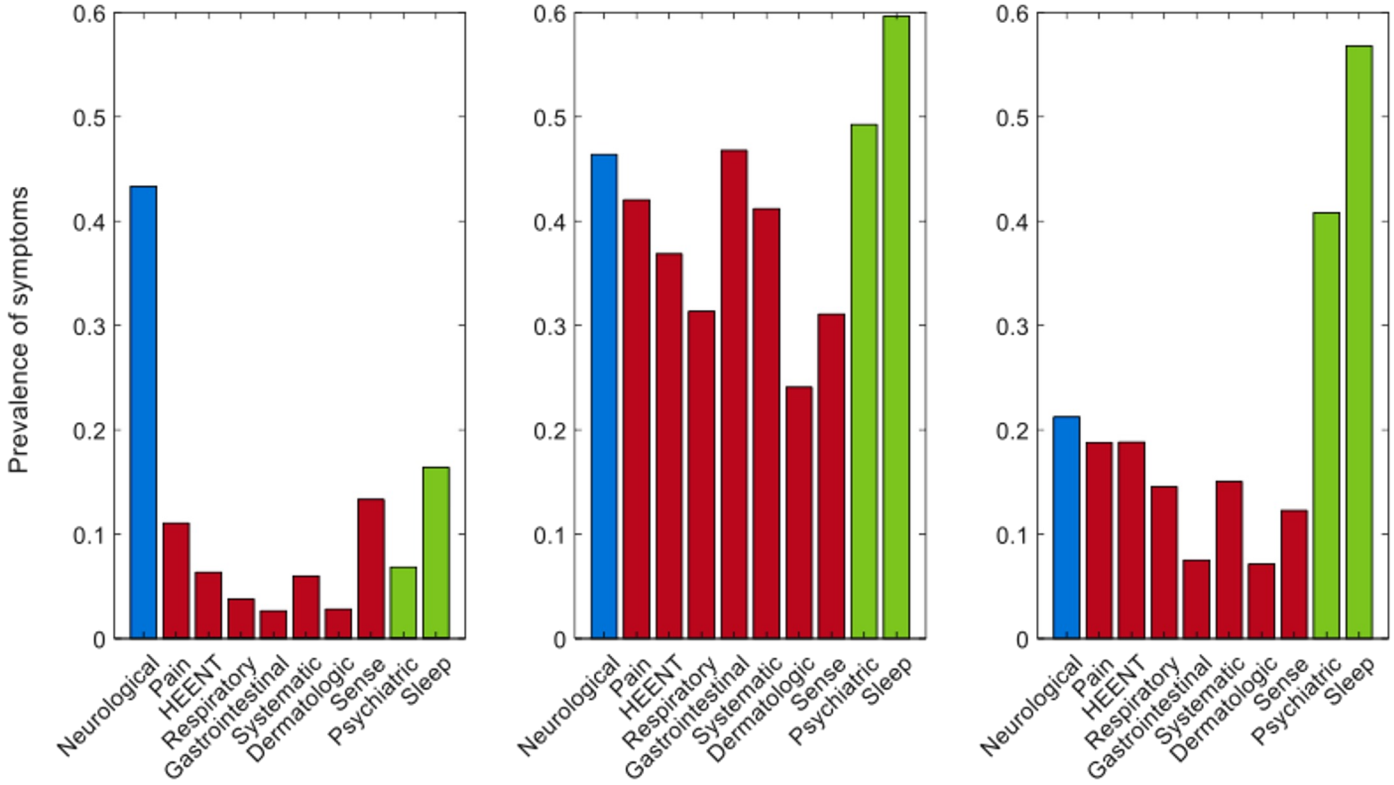








Symptom Clustering



Implications

1. LISTEN participants with either LC or PVS have similar demographic characteristics
2. Both groups reported numerous symptoms and overall poor health status
3. The most important symptoms that differentiate the groups seem to be brain fog, changed sense of smell, cough, and burning sensations
4. The clustering analysis reveals three clusters, where one has a relatively higher proportion of people with vaccine-associated symptoms. This may suggest that the mechanisms for the two conditions are distinct.

Acknowledgements

LISTEN participants

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Questions or Comments?

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