

BACKGROUND

- Long COVID, or post-COVID-19 condition, affects many individuals with persistent symptoms like cognitive impairment, fatigue, and emotional distress, impacting their quality of life.
- Current management mainly relies on supportive care, highlighting the need for novel therapies.
- Neurofeedback is a non-invasive therapy that promotes brain self-regulation through auditory feedback, showing improvement in symptoms such as cognitive impairment, fatigue, and emotional distress in other patient populations, including cancer survivors.
- We propose using neurofeedback to address persistent symptoms of Long COVID.



OBJECTIVE

This nurse-led study aimed to assess the feasibility of nonlinear dynamical (NLD) neurofeedback as a rehabilitation strategy to alleviate cognitive impairment, fatigue, and other symptoms in individuals with Long COVID.

METHODS

Research Design:

- Quasi-experimental repeated measures feasibility study

Sample and Setting:

- Participants:** Adults with Long-COVID symptoms ≥ 3 months post-confirmed COVID-19 (RAT or PCR)
- Recruitment:** Posters/postcards in community & healthcare settings; social media
- Location:** A Southeast Ontario Neurofeedback Research (SONR) Lab
- Personnel:** Certified NeuroOptimal neurofeedback trainers who are RNs or supervised by an RN

Intervention & Procedures:

- Screening:** Phone interview by trained RN for eligibility and consent
- Neurofeedback Protocol:** 20 sessions of NeuroOptimal NLD neurofeedback
- 2 sessions/week over 10 weeks (~45 min/session)
- Assessment Timeline:**
 - T0 – Baseline
 - T1 – Week 5 (midpoint)
 - T2 – Week 10 (endpoint)
 - T3 – Week 20 (follow-up)
- Data Collection:** Online surveys via Qualtrics survey platform, completed on-site

Outcome Measures:

- Feasibility & Acceptability:
 - Study participation rates
 - Survey response rates
 - Study withdrawal rates
- Symptom Burden LONG COVID: SBQ-LC
- Cognitive function – FACT-Cog32
- Fatigue – FACIT-Fatigue
- Sleep quality – SF-PSQI
- Anxiety – Beck Anxiety Inventory (BAI)
- Depression – Beck Depression Inventory (BDI)

PRELIMINARY RESULTS

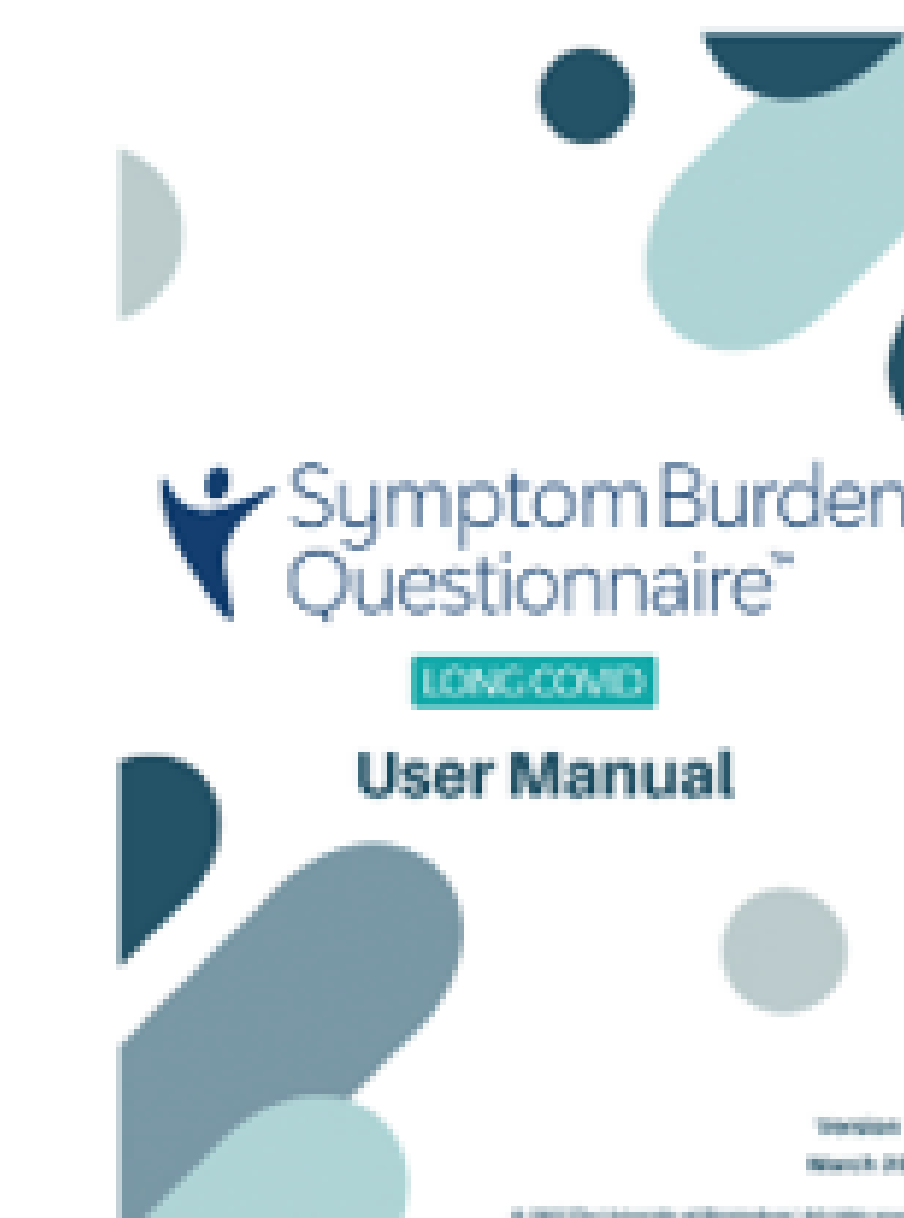
Participants (N=23)



- Age**
 - Mean: 51.9 years
 - Range: 23-73 years
- Gender**
 - Female: N=19 (82.6%)
 - Male: N=3 (13.0%)
 - Non-Binary: N=1 (4.3%)
- Marital Status**
 - Married/Common-Law: N=12 (52.2%)
 - Single/Separated/Divorced/Widowed: N=11 (47.8%)
- Education**
 - Elementary/High School: N=3 (13%)
 - College/Undergraduate University: N=12 (52.2%)
 - Graduate School: N=8 (34.8%)

Symptom Burden Questionnaire-Long COVID (SBQ-LC)

- Assesses **symptom burden** (severity, frequency or presence) and **overall interference on daily activities**
- 17 symptom scales
- Questions scored on 4-point scale from 0 (no impact) to 3 (severe impact)
- Higher scale scores represent greater symptom burden



Selected SBQ-LC Scale Results

Symptom Scale	Baseline Mean (SD)	Midpoint (5 weeks)	Endpoint (10 weeks)	Follow-Up (20 weeks)	Sig (p)
Memory, Thinking & Communication	50.75 (8.81)	42.00 (14.21)	34.25 (19.26)	32.08 (13.62)	<.001
Fatigue	73.92 (23.92)	48.50 (28.63)	40.17 (31.13)	39.58 (28.45)	<.001
Mental Health	39.83 (11.33)	36.25 (15.12)	31.92 (27.02)	30.92 (15.42)	.160
Impact on Daily Life	43.75 (12.98)	35.83 (19.07)	27.17 (16.07)	24.42 (14.74)	<.001

- Preliminary results presented are based on data from 23 participants
- An additional 2 participants are still participating in the study
- For four variables of interest on the SBQ-LC participants reported significant improvements in memory, thinking & communication, fatigue and impact on daily life following 20 sessions of NLD neurofeedback
- Improvements in mental health were not statistically significant.
- Participants also reported improvements in other symptoms such as pain and sleep problems.

CONCLUSION

- Results mirror results from our cancer survivor pilot feasibility studies
- Provides preliminary evidence that neurofeedback may be an effective therapy for Long COVID symptoms
- Limitations: lack of control group
- Supports need for a larger RCT to demonstrate efficacy
- Suggest use of wait-list controlled or placebo (sham neurofeedback) controlled studies in the future

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