

Pre-COVID to Now: Changes in Self-Reported Health Outcomes in Long-COVID

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Introduction

Long-COVID (LC): COVID-19 symptoms persisting beyond 3 months and for at least 2 months¹. LC affects 1.4 million Canadians, causing debilitating symptoms such as fatigue, stroke, and cognitive-communication (C-C) difficulties^{2,3}.

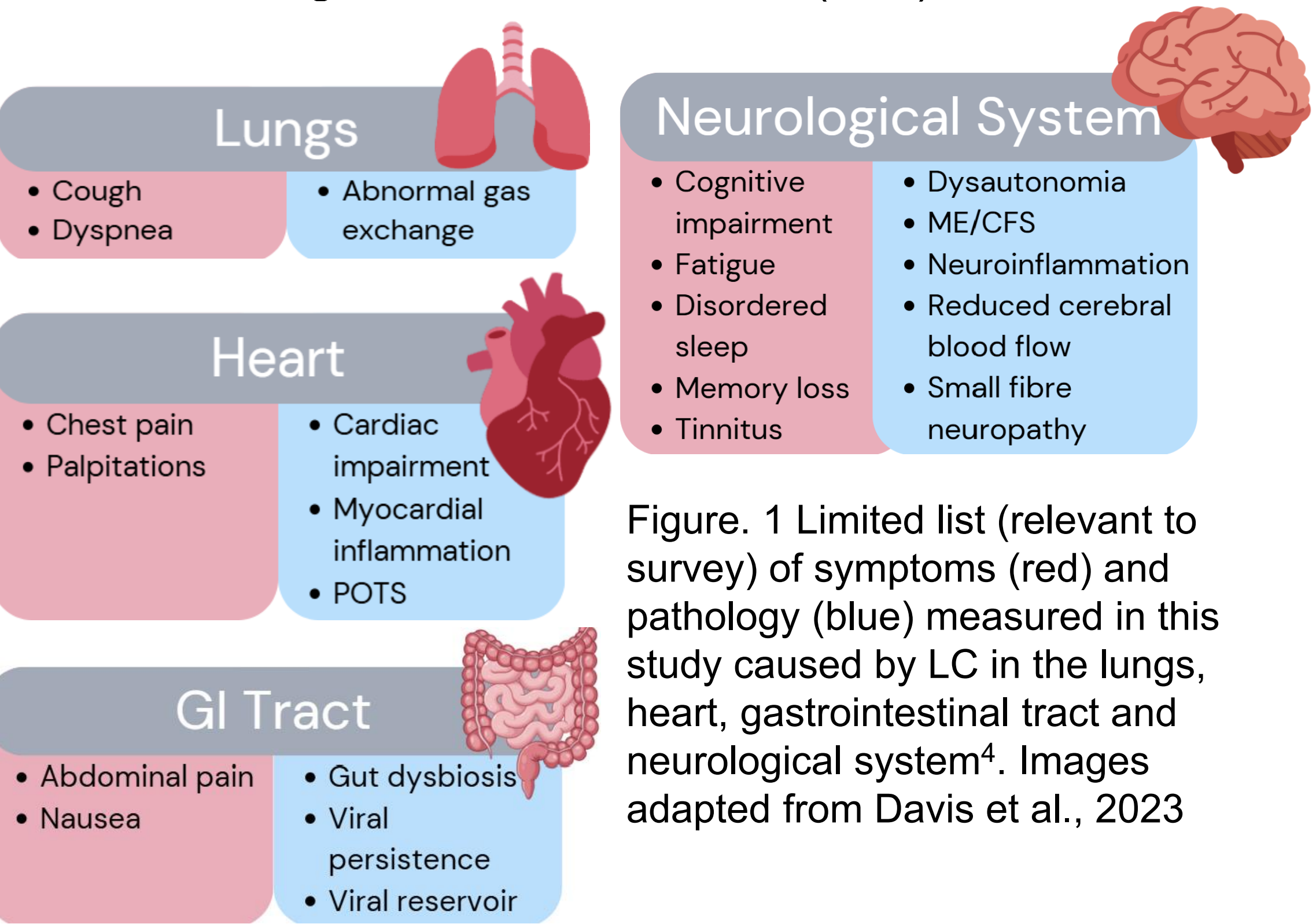


Figure. 1 Limited list (relevant to survey) of symptoms (red) and pathology (blue) measured in this study caused by LC in the lungs, heart, gastrointestinal tract and neurological system⁴. Images adapted from Davis et al., 2023

A lack of clear diagnostic criteria and practice guidelines on the diagnosis, management, and rehabilitation of LC severely impacts the population⁴. An exhaustive understanding of the cognitive deficits experienced in LC is required to help build consensus in diagnostics.

Objectives

- 1) Compare pre-COVID to current symptom severity across multiple symptom categories.
 - 2) Identify the most debilitating cognitive C-C deficits within a Canadian LC cohort.
- This is the first step of a larger project aiming to characterize C-C deficits in LC.

Methods

Participants completed the Modified COVID-19 Yorkshire Rehabilitation Scale, via REDCap, as part of a larger study evaluating cognitive-linguistic deficits in LC. The scale measures 30 pre- and post-LC related physical, cognitive, and psychological symptoms.

Please answer the questions below to the best of your knowledge.
'Now' refers to how you feel now/this week (last 7 days).
"Pre-COVID" refers to how you were feeling prior to contracting the illness.
If you are unable to recall this, just state 'don't know'

Rate the severity of each problem on a scale of 0-3:
0 = None; no problem
1 = Mild problem; does not affect daily life
2 = Moderate problem; affects daily life to a certain extent
3 = Severe problem; affects all aspects of daily life; life-disturbing

1. Breathlessness	Breathlessness:	Now	Pre-COVID
	a) At rest	0 ☐ 1 ☐ 2 ☐ 3 ☐	0 ☐ 1 ☐ 2 ☐ 3 ☐
	b) Changing position e.g. from lying to sitting or sitting to lying	0 ☐ 1 ☐ 2 ☐ 3 ☐	0 ☐ 1 ☐ 2 ☐ 3 ☐
	c) On dressing yourself	0 ☐ 1 ☐ 2 ☐ 3 ☐	0 ☐ 1 ☐ 2 ☐ 3 ☐
	d) On walking up a flight of stairs	0 ☐ 1 ☐ 2 ☐ 3 ☐	0 ☐ 1 ☐ 2 ☐ 3 ☐
6. Cognition	Problems with concentration	0 ☐ 1 ☐ 2 ☐ 3 ☐	0 ☐ 1 ☐ 2 ☐ 3 ☐
	Problems with memory	0 ☐ 1 ☐ 2 ☐ 3 ☐	0 ☐ 1 ☐ 2 ☐ 3 ☐
	Problems with planning	0 ☐ 1 ☐ 2 ☐ 3 ☐	0 ☐ 1 ☐ 2 ☐ 3 ☐
8. Post-exertional malaise (worsening of symptoms)	Crashing or relapse hours or days after physical, cognitive or emotional exertion	0 ☐ 1 ☐ 2 ☐ 3 ☐	0 ☐ 1 ☐ 2 ☐ 3 ☐

Figure. 2 Excerpt taken from the Modified COVID-19 Yorkshire Rehabilitation Scale comparing Breathlessness experienced during specific actions (at rest, changing position, dressing yourself, and walking upstairs), cognition (problems with concentration, memory, and planning), and post-exertional malaise (PEM) pre-COVID to within the past week.

Wilcoxon signed rank tests were used for analysis using Bonferroni correction ($\alpha=0.05/30=0.0017$) with Age and Months since Onset of COVID-19 infection included as covariates.

Results

Results from 30 participants with LC (29 female, 1 male) were used in this analysis.

Participant Demographics	Mean $\pm$ SD	Range
Age	50 $\pm$ 15	26-85
Years of education	17 $\pm$ 2	12-23
Months since onset of COVID-19	32 $\pm$ 11	14-59

Table. 1 Demographic table for participants with LC who completed the Modified COVID-19 Yorkshire Rehabilitation Scale.

Significant differences in self-reported functioning for 30/30 symptoms (no effect of age or time post-onset). Greatest changes in symptom severity pre-COVID to present in: (1) instrumental activities of daily living (iADL), (2) fatigue, (3) memory, (4) PEM, and (5) communication.

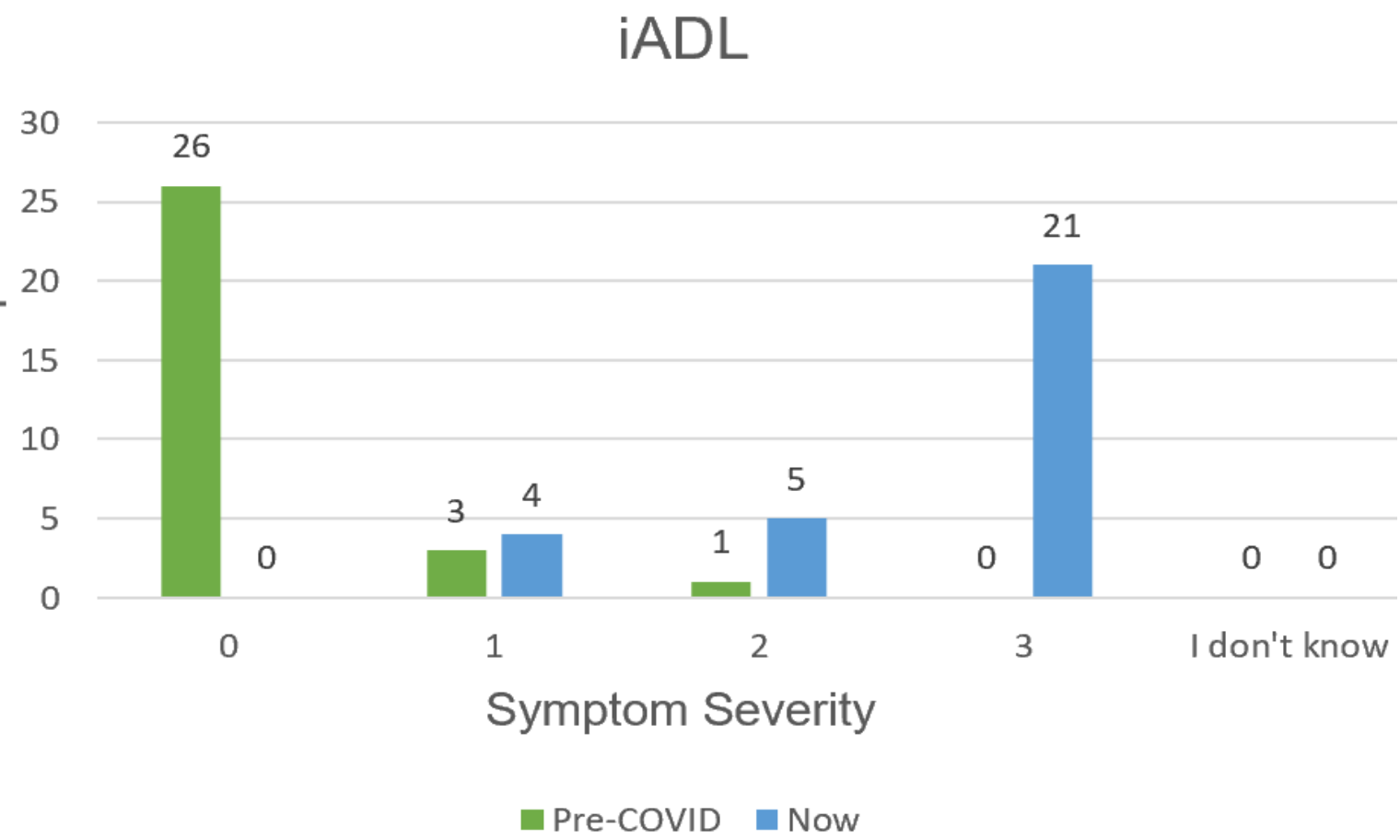


Figure. 3 Participant count data reporting iADL difficulties comparing pre-COVID (green) to recent experience (blue).

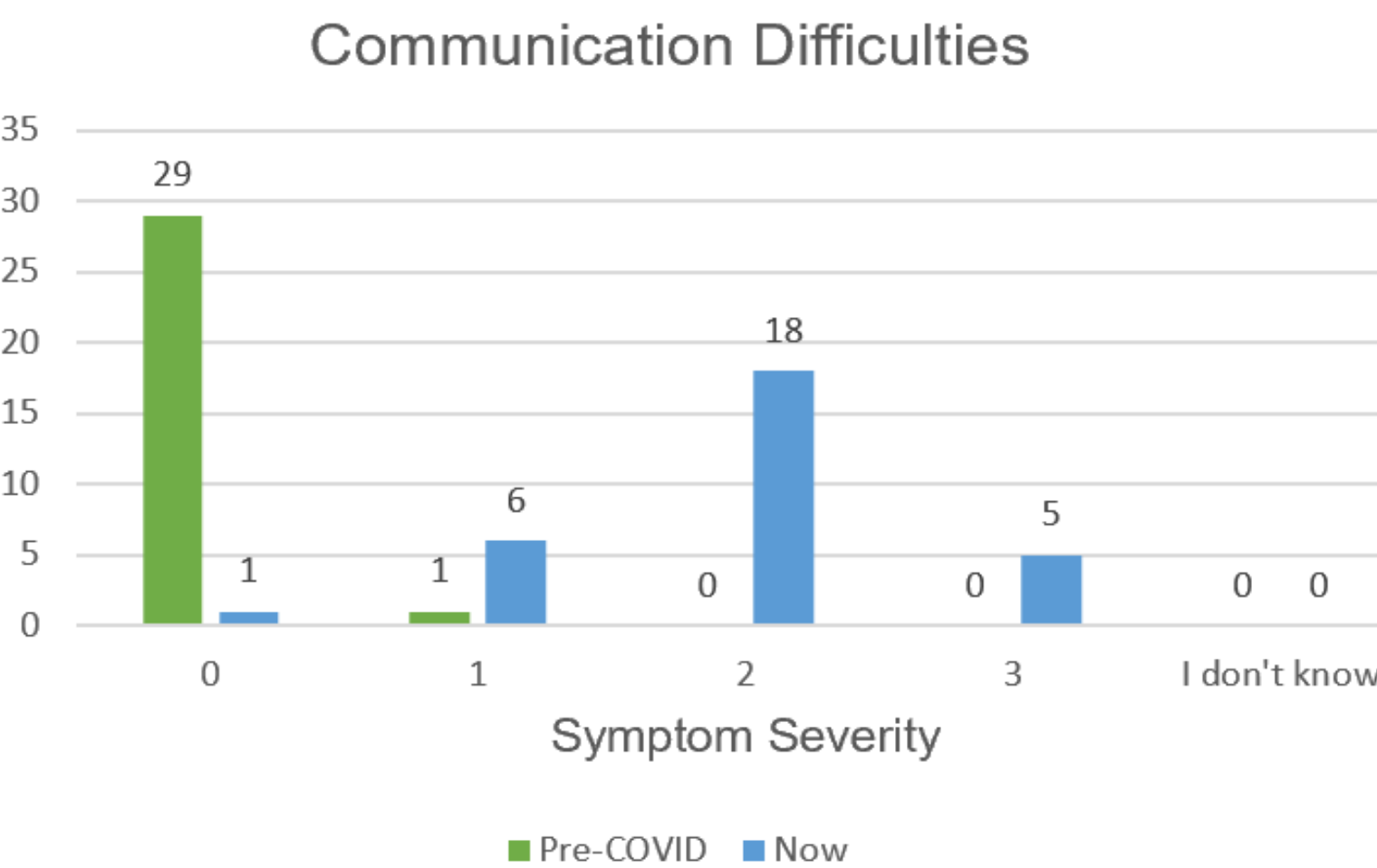


Figure. 4 Participant count data reporting communication difficulties ratings comparing pre-COVID (green) to recent experience (blue).

Conclusions

Participants with LC experience **significant functional deficits** across **all symptom categories**. Symptom severity is evenly distributed across different Ages and Onset. C-C difficulties are among the most frequently reported symptoms to be severely impacted (memory, concentration, planning, and communication).

Future Directions

Ongoing investigations are underway to identify the extent of C-C deficits in LC. We aim to determine whether automated language analysis can be used as a biomarker for LC and to develop sensitive diagnostic tools. Interpretable natural language models are highly feasible, accessible, and expected to relieve diagnostic stress.

Acknowledgements

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