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Longitudinal gait changes in functional neurological disorder: A 12-month prospective study

Sara Issak [a,b,*], Glenn Nielsen [c], Natalie A. Fini [a], Richard A. Kanaan [d], Gavin Williams [a,b]

[a] Department of Physiotherapy, Melbourne School of Health Sciences, The University of Melbourne, Level 7, Alan Gilbert Building, 161 Barry St, Carlton, Victoria 3053, Australia
[b] Department of Physiotherapy, Epworth Healthcare, 888 Toorak Road Camberwell, Victoria 3124, Australia
[c] Neurosciences Research Centre, Molecular & Clinical Sciences Research Institute, St George's, University of London, Cranmer Terrace, London SW17 0RE, UK
[d] Department of Psychiatry, University of Melbourne, Austin Health, Level 4, Lance Townsend Building, 145 Studley Road, Heidelberg, Victoria 3084, Australia

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ABSTRACT

Background: Functional gait disorder (FGD) is a subtype of functional neurological disorder (FND) characterized by abnormal walking patterns. Long-term symptom progression and factors influencing gait changes in FGD remain poorly understood.
Objectives: To investigate longitudinal changes in gait and associated symptoms over 12 months in individuals with FGD and examine whether changes in specific symptoms are associated with changes in gait.
Methods: Individuals with FND and altered gait completed an online survey at baseline and at 3-, 6-, and 12-month follow-up points. The survey collected data on symptom severity, gait changes, and standardised outcome measures. Analyses included descriptive statistics, linear mixed models, Kruskal–Wallis tests, and Spearman's rank correlations.
Results: Of 156 baseline respondents, 65 completed the 12-month follow-up. Sixteen (28.5 %) reported worsening gait, 17 (30.4 %) no change, 13 (23.2 %) improvement, and 10 (17.8 %) fluctuating gait. Linear mixed-model analyses showed no significant within-subject changes in motor or non-motor symptom severity from baseline to 12 months. Greater baseline functional seizure severity was strongly associated with poorer gait outcomes at 12 months ($R_s = -0.750$, $p < 0.001$, $n = 17$). Higher muscle rigidity severity at 12 months was also strongly associated with worse gait ($R_s = -0.604$, $p < 0.001$, $n = 30$).
Conclusion: This study provides insights into the natural course of functional gait disorder over time, based on participant self-report, revealing heterogeneous trajectories. Exploratory analyses found that functional seizure and muscle rigidity severity were associated with gait decline.

1. Introduction

Functional Neurological Disorder (FND) is characterized by sensory and motor symptoms arising from alterations in brain network functioning rather than structural abnormalities [1]. Among individuals with motor presentations of FND, functional gait disorder (FGD) is common, reported in up to 37 % of cases [2]. Functional gait disorder can present with a variety of phenotypes, including abnormal movements (e.g., tremor, dystonia, ataxia), paralysis (e.g., hemiparesis, paraparesis), or balance-related disturbances (e.g., slow cautious gait, wide-based gait) [3]. These gait disturbances may occur as an isolated syndrome or in a mixed presentation alongside other functional symptoms [4–7]. For the purposes of this paper, 'FGD' will refer to both. People with FGD typically experience other motor and non-motor symptoms which contribute to disability, loss of independence, reduced participation, and reduced quality of life [8].

The long-term trajectory of gait impairment in FGD remains poorly understood. Research has primarily focused on short-term outcomes or the immediate effects of rehabilitation, with limited studies examining changes in gait over extended periods [9–12]. Understanding how gait changes over time is crucial for treatment planning, and identifying predictive factors associated with improvement or deterioration.

* Corresponding author at: Department of Physiotherapy, Melbourne School of Health Sciences, The University of Melbourne, Level 7, Alan Gilbert Building, 161 Barry St, Carlton, Victoria 3053, Australia.
E-mail addresses: sissak@student.unimelb.edu.au (S. Issak), gnielsen@citystgeorges.ac.uk (G. Nielsen), natalie.fini@unimelb.edu.au (N.A. Fini), richard.kanaan@unimelb.edu.au (R.A. Kanaan), Gavin.Williams@epworth.org.au (G. Williams).

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Longitudinal studies are needed to investigate gait impairment and associated symptoms over time. A clearer understanding of the trajectory of gait changes in FGD could support realistic expectations for recovery and the development of targeted treatment approaches. Additionally, recognizing patterns of decline or improvement may help guide self-management approaches and inform rehabilitation priorities.

The primary aim of this study was to determine whether individuals with FGD report changes in gait over a period of 12 months. The secondary aims were to: 1) assess changes in self-reported motor and non-motor symptom severity over 12 months, and 2) identify whether any changes in motor and non-motor symptoms were associated with gait changes.

2. Methods

2.1. Design and ethics

This study formed Stage 2 of an online survey. Stage 1 surveyed self-reported motor and non-motor symptoms, and other standardised outcome measures with the aim of examining the clinical and demographic characteristics of a cohort with FGD [8]. The aim of Stage 2 was to focus on longitudinal examination of gait changes in this cohort. Respondents provided consent to complete longitudinal surveys at baseline, three, six and 12-months. Automated email links were sent to participants at the respective time points, with an additional reminder email sent if no response was provided to the survey link. Longitudinal data were collected from 1st May 2022 to 1st September 2023 using the secure, web-based software platform, Research Electronic Data Capture tool (REDCap) hosted at The University of Melbourne. Approval was obtained from the University of Melbourne's Office of Research Ethics and Integrity (Reference Number: 2021–22,778–23,936-3).

2.2. Participants and recruitment

Adults (≥18 years) with a diagnosis of FND from a medical professional, and self-reported altered or impaired walking, were eligible for participation in the study. Participants were excluded if they were non-ambulant. Participants completed screening questions prior to commencement to ensure eligibility. The survey was advertised on social media through FND-peer support groups and within professional FND networks. Participants were recruited via self-selection sampling.

2.3. Survey content

The survey was in English. A comprehensive list of motor and non-motor symptoms commonly reported in people with FND was compiled from a review of the literature [13,14]. Respondents were asked to rate the severity of each of the symptoms they experienced at the time of the survey on a sliding scale from 0 to 100, with 100 indicating the highest severity. For this study, we analysed the motor and non-motor symptoms likely to be associated with gait (see Table 1), as informed by the baseline study [8].

A battery of standardised outcome measures was also included in the survey, informed by the recommendations of a systematic review of outcome measures in FND [15]. Quality of life was measured using the 36-Item Short Form Survey (SF36) [16]. Participation was assessed through the Work and Social Adjustment Scale (WSAS) [17]. Physical symptoms and mental health were measured with the Patient Health

Table 1
Longitudinal analysis of self-reported motor and non-motor symptom severity over 12 months.

Symptom	Timepoint	Mean (SE)	n	Estimate (Change)	SE	95 % CI (Lower, Upper)	t	p
Weakness	Baseline	63.90 (14.59)						
	12 months	61.32 (14.64)	43	−2.58	3.09	−8.67, 3.52	−0.84	0.404
Tremor	Baseline	53.72 (15.34)						
	12 months	54.01 (15.42)	29	0.29	3.79	−7.22, 7.79	0.08	0.939
Jerks	Baseline	58.23 (15.30)						
	12 months	58.07 (15.35)	34	−0.16	3.16	−6.42, 6.11	−0.05	0.960
Dystonia	Baseline	60.28 (14.69)						
	12 months	63.19 (14.82)	28	2.91	3.63	−4.28, 10.10	0.80	0.424
Rigidity	Baseline	62.66 (15.32)						
	12 months	60.74 (15.39)	24	−1.92	4.14	−10.14, 6.29	−0.47	0.643
Ataxia	Baseline	63.58 (14.29)						
	12 months	65.06 (14.35)	30	1.48	3.30	−5.08, 8.03	0.45	0.656
Bradykinesia	Baseline	63.50 (15.51)						
	12 months	59.16 (15.59)	30	−4.34	3.52	−11.31, 2.63	−1.23	0.220
Reduced balance	Baseline	65.39 (15.34)						
	12 months	61.90 (15.44)	40	−3.50	3.36	−10.18, 9.12	−1.04	0.300
Pain	Baseline	67.09 (13.48)						
	12 months	68.95 (13.50)	38	1.86	2.37	−2.83, 6.55	0.78	0.435
Fatigue	Baseline	75.76 (12.91)						
	12 months	72.76 (12.96)	50	−2.99	2.23	−7.39, 1.40	−1.35	0.180
Fear of falling	Baseline	61.66 (16.19)						
	12 months	59.97 (16.39)	16	−1.69	4.60	−10.87, 7.48	−0.37	0.714
Fear of moving (kinesiophobia)	Baseline	80.50 (17.27)						
	12 months	68.75 (17.27)	2	−11.75	13.47	−41.39, 17.90	−0.87	0.402
Somatosensory symptoms	Baseline	67.12 (15.12)						
	12 months	69.01 (15.22)	36	1.89	3.24	−4.51, 8.29	0.58	0.560
Cognitive symptoms	Baseline	68.56 (13.24)						
	12 months	69.56 (13.34)	37	1.09	3.39	−5.61, 7.79	0.32	0.748
Dissociation	Baseline	65.72 (14.77)						
	12 months	61.70 (14.93)	24	−4.02	3.99	−11.96, 3.91	−1.01	0.316
Dizziness	Baseline	62.12 (16.51)						
	12 months	60.00 (16.61)	25	−2.11	4.03	−10.10, 5.88	−0.53	0.601
Visual symptoms	Baseline	59.17 (16.60)						
	12 months	57.62 (16.84)	18	−1.55	4.93	−11.36, 8.25	−0.32	0.753
Functional seizures	Baseline	63.66 (16.57)						
	12 months	59.97 (16.85)	14	−3.69	5.43	−14.57, 7.20	−0.68	0.500

Linear mixed model analysis was conducted. n = number of participants included in pairwise contrasts at these timepoints with available data; missing data were excluded in model fitting. SE (standard error).

Questionnaire (PHQ15) [18], and the Hospital Anxiety and Depression Scale (HADS) [19] respectively. Other questionnaires included the Falls Self Efficacy Scale (FSES) [20], and Tampa Scale for Kinesiophobia (TSK) [21]. For mobility, independence in ambulation was measured with the Functional Ambulation Category (FAC) [22], and the Functional Mobility Scale (FMS) was used to determine mobility aids needed by respondents to ambulate [23].

The survey content at the longitudinal follow up time-points was identical to that completed at baseline, with the exception of an additional question, asking respondents to self-report changes to their gait. Respondents could select one response from the following options: 1) worsened and continued to worsen; 2) worsened but then stabilized (but remains worse); 3) worsened but then stabilized to where I was before; 4) remained the same; 5) improved but then stabilized to where I was before; 6) improved but then stabilized (but remains better); 7) improved and continued to improve. The Checklist for Reporting Of Survey Studies was used to report findings [24].

2.4. Statistical analyses

A power calculation was conducted to determine the baseline survey sample size, aiming for 90 % power to detect a moderate association between self-reported symptoms and the health domains examined. This resulted in a required sample size of 109 respondents [8].

Descriptive statistics were computed to report cohort demographics. Longitudinal analyses were conducted on all available data. Wilcoxon Signed-Rank test and McNemar's test were conducted for ordinal and dichotomised variables (FMS and FAC). A linear mixed-model analysis was conducted for continuous variables, and pairwise contrasts were extracted to identify any change between time points; this was conducted for self-reported symptom severity ratings and outcome measures with continuous scales (FSES, TSK, WSAS, HADS, SF36, PHQ15). Participants were included in the models as random effects, with time included as a fixed effect. The normality of symptom severity ratings was assessed using Q-Q plots to determine whether parametric or non-parametric statistical tests should be applied. Independent *t*-tests were conducted for sensitivity analyses between respondents who completed the follow- up survey and those lost to follow-up.

To explore the correlation between gait changes at 12 months and symptom severity ratings at both baseline and 12 months, Spearman rank correlation analyses were conducted. Bonferroni correction was applied to account for multiple comparisons, resulting in an adjusted significance threshold of $\alpha = 0.00139$ (36 comparisons). Gait change groups were analysed using the original 7-point gait change scale (see survey content above). Correlation coefficients (R_s) were interpreted as follows: values <0.20 as very weak, 0.20–0.39 as weak, 0.40–0.59 as moderate, 0.60–0.79 as strong, and ≥ 0.80 as very strong [25].

To identify whether motor or non-motor symptom severity at 12 months was associated with gait changes, Kruskal–Wallis tests were conducted. Symptom severity scores were compared across gait change groups at 12 months. When statistically significant ($p < 0.05$) results were found, post-hoc Mann–Whitney U pairwise comparisons were performed to examine specific group differences in symptom severity. For this analysis and the Kruskal–Wallis tests, the original 7-point gait change scale was collapsed into three broader categories due to limited observations in individual groups: 1) declined gait, comprising "worsened and continued to worsen" and "worsened but then stabilized (but remains worse)"; 2) no change, comprising "worsened but then stabilized to where I was before," "remained the same," and "improved but then stabilized to where I was before"; and 3) improved gait, comprising "improved but then stabilized (but remains better)" and "improved and continued to improve." Bonferroni correction was applied to adjust for multiple comparisons in the post-hoc tests, resulting in an adjusted significance threshold of $\alpha = 0.0009$ (54 comparisons). Data were analysed using IBM SPSS Version 28.0.1.0.

3. Results

3.1. Demographics

Of the 156 participants who completed the baseline survey, 149 (95.5 %) consented to longitudinal follow-up. Response rates at each follow-up time point were: 28 (18.8 %) at 3 months, 25 (16.8 %) at 6 months, and 65 (43.6 %) at 12 months. As the response rate at the three- and six-month timepoints was low and did not include the same individuals at each timepoint, the results are based on analysis of baseline and 12-month data. Data from the three- and six-month surveys are provided in Supplementary File A, Table 1–6.

The mean age of respondents who completed the 12-month follow-up surveys ($n = 65$) was 45.6 years (SD 14.1, range 18–60). The majority were female ($n = 55$, 84.6 %). Diagnosis was provided by a neurologist in 57 (87.7 %) cases, a psychiatrist in 4 (6.2 %) cases, and by another medical speciality in 4 (6.2 %). The median symptom duration for the cohort was 3.5 years (IQR = 1.1–6.5), with half of the cohort ($n = 33$, 50.8 %) having previously received treatment for their FND (prior to baseline survey completion), and 20 (30.8 %) respondents receiving active treatment at the time of baseline survey completion. In 16 (24.6 %) respondents, a comorbid condition was reported that could have also impacted their gait, such as sciatica or osteoarthritis.

Comparisons were conducted between 12-month follow-up survey responders ($n = 65$) and non-responders lost to attrition ($n = 84$). Independent *t*-tests, of all motor and non-motor symptoms at baseline, found no statistically significant difference in baseline symptom severity ratings between longitudinal survey responders and non-responders. See supplementary File A, Tables 7–8 for detailed results. Similarly, independent t-tests indicated that there were no statistically significant differences found between age; $p = 0.123$ (mean age of 42.1, SD 12.9), and symptom duration; $p = 0.236$ (median of 3.2 years, IQR = 1.5–6.8) at baseline. The majority of non-responders were female ($n = 80$, 95.2 %). A chi-square test of independence showed a statistically significant difference between sex and response status, $p = 0.028$, $\chi^2(1, N = 149) = 4.86$. When adjusting for the total number of individuals in each sex, males had a significantly higher response rate (10/14 = 71 %) compared to females (55/135 = 41 %). A chi-square test of independence revealed a significant difference between survey response status and previous treatment history ($p = 0.009$, $\chi^2(1, N = 149) = 6.80$) with a greater portion of responders having had previous treatment (33/58 = 57 %) compared to those with no treatment history (32/91 = 35 %).

3.2. Gait changes at 12-months

The self-reported gait change question was answered by 56 out of 65 survey respondents. Of those, 16 (28.5 %) reported worsening gait, 17 (30.4 %) no change, 13 (23.2 %) improvement. The remaining 10 (17.8 %) reported a fluctuation followed by stabilisation; with 7 (12.5 %) reporting worsening gait followed by stabilisation to baseline, and 3 (5.4 %) reporting improvements, followed by stabilisation to baseline (See Fig. 1).

At baseline, 128 participants completed the Functional Ambulation Category. At the 12-month follow-up, 57 of these individuals also completed the FAC as part of the longitudinal survey. Among the 57 respondents with paired data, 21 (36.8 %) were dependent on another person for ambulation, while 36 (63.2 %) were independently ambulant at 12 months. At baseline, within this same subgroup, 27 (47.4 %) were dependently ambulant and 30 (52.6 %) were independent. McNemar's test, examining within-subject changes in FAC scores between baseline and 12 months, was not statistically significant ($p = 0.210$). Full results are available in Supplementary File B, Table 1.

At baseline, 128 participants completed the Functional Mobility Scale. At the 12-month follow-up, 57 of these individuals also completed the FMS as part of the longitudinal survey. Among the 57 respondents with paired data, 19 (33.3 %) required a walking frame to ambulate over

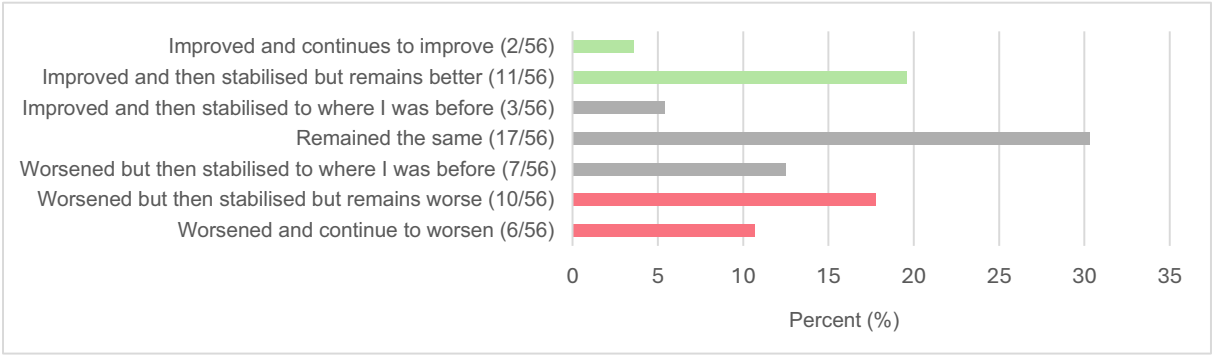

Fig. 1. Self-reported gait changes at 12-months post baseline survey (n = 56).
This data represents the longitudinal respondents who self-reported their gait changes in the 12-month follow-up survey. The number of respondents is shown in brackets beside each category.

a 50-m distance, 3 (5.3 %) required crutches, 16 (28.1 %) used a walking stick, and 19 (33.3 %) did not require a mobility aid. At baseline, within this same subgroup, 24 (42.1 %) used a walking frame, 3 (5.3 %) used crutches, 12 (21.1 %) used a walking stick, and 18 (31.5 %) did not use a mobility aid. A Wilcoxon signed-rank test, examining within-subject changes in FMS scores between baseline and 12 months, was not statistically significant ($p = 0.204$). Full results are available in Supplementary File B, Table 2.

Comparison between the self-reported gait change outcomes in those who had received prior treatment and those who hadn't, was conducted. In the 56 respondents who completed the longitudinal survey, 30/56 had received treatment at baseline, and 26/56 had not received treatment at baseline. At 12-months, in the no-treatment group, 10/26 reported a decline in gait, 14/26 no change, and 2/26 improved. At 12-months, in the treatment-group, 6/30 declined, 13/30 no change and 11/30 improved. A Chi-square test of independence showed a significant association between prior treatment and self-reported 12-month gait outcome, $\chi^2(2, N = 56) = 7.018$, $p = 0.030$, indicating that those that had received prior treatment, had better gait outcomes.

3.3. Self-reported symptom severity at 12-months

Linear mixed-model analyses found no statistically significant differences in severity ratings for all motor or non-motor symptoms between within-subject baseline and 12-month timepoints (see Table 1).

3.4. Outcome measures at 12-months

Linear mixed-model analyses examined the within-subject changes in outcome measurements completed at baseline and 12-month time points. There were a number of statistically significant improvements in the mean scores of the repeated outcome measures at 12-months. Table 2 contains a summary of the findings. Mean FSES scores at 12-months indicated a significant reduction in fear of falling when compared to baseline. The HADS revealed significantly less anxiety and depression at 12-months when compared to baseline. The 12-month TSK results also indicated significantly improved mean scores, when compared to baseline, indicating less kinesiophobia. At 12-months, the WSAS revealed a significant reduction in mean scores (i.e. less impact on work and social function), when compared to baseline. Summary scores from the SF36 questionnaire showed a significant improvement in mean mental health-quality of life scores at 12-months compared to baseline. There were no statistically significant differences in the SF36 physical-quality of life summary score, nor the PHQ15 scores at 12-months compared to baseline.

3.5. Correlation between symptoms and gait changes

Exploratory spearman's rank correlations, with bonferroni corrections, were used to examine the relationships between symptom severity ratings at both baseline and 12-months, and gait changes at 12-months. Two statistically significant associations were identified. Functional

Table 2
Results from the longitudinal analyses of continuous outcome measures.

Questionnaire	Timepoint	Mean (SE)	n	Estimate (Change)	SE	95 % CI (Lower, Upper)	p
FSES	Baseline	42.08 (1.65)					
	12 months	37.83 (1.72)	57	−4.25	1.03	−7.02, −1.48	**< 0.001**
HADS – anxiety	Baseline	10.71 (0.55)					
	12 months	9.13 (0.59)	57	−1.58	0.47	−2.84, −0.32	**0.006**
HADS – depression	Baseline	8.91 (0.49)					
	12 months	7.29 (0.53)	57	−1.62	0.41	−2.74, −0.51	**< 0.001**
TSK	Baseline	42.01 (0.97)					
	12 months	38.59 (1.04)	57	−3.42	0.79	−5.55, −1.29	**< 0.001**
WSAS	Baseline	25.52 (1.14)					
	12 months	22.41 (1.23)	56	−3.11	0.94	−5.65, −0.57	**0.008**
MCS – SF36	Baseline	34.70 (1.56)					
	12 months	40.31 (1.69)	56	5.61	1.36	1.96, 9.26	**< 0.001**
PCS – SF36	Baseline	29.45 (1.06)					
	12 months	30.31 (1.15)	56	0.86	0.89	−1.53, 3.25	1.000
PHQ15	Baseline	14.10 (0.70)					
	12 months	13.23 (0.74)	57	−0.87	0.51	−2.25, 0.51	0.564

Linear mixed model analyses was conducted for each outcome measure separately. n = number of participants included in pairwise contrasts at these timepoints with available data, SE (standard error). FSES (falls self-efficacy scale); HADS (hospital anxiety and depression scale); TSK (tampa scale for kinesiophobia), WSAS (work and social adjustment scale); MCS-SF36 and PCS-SF36 (mental health component summary score of the 36-item short form survey, and physical health component summary respectively); PHQ15 (Patient health questionnaire).

seizure severity at baseline showed a strong negative correlation with gait outcome at 12-months ($R_s = -0.750$, $p < 0.001$, $n = 17$), indicating that greater seizure severity was associated with greater gait decline over time. Similarly, muscle rigidity severity at 12-months was strongly negatively correlated with gait outcome at 12 months ($R_s = -0.604$, $p < 0.001$, $n = 30$), suggesting that participants with more severe muscle rigidity experienced greater gait deterioration. Full results are provided in Supplementary File B, Table 3.

A series of exploratory kruskal–wallis tests were conducted to examine differences in 12-month motor and non-motor symptom severity ratings among the three merged gait change categories: 1) declined gait ($n = 16$), 2) no change ($n = 27$), and 3) improved gait ($n = 13$). Nominally significant group differences were observed for muscle rigidity ($\chi^2(2) = 8.546$, $p = 0.014$, $\eta^2 = 0.30$) and pain ($\chi^2(2) = 6.284$, $p = 0.043$, $\eta^2 = 0.15$). No other symptoms showed significant differences across gait change groups. Post hoc Mann–Whitney *U* tests were conducted to further explore these differences; however, after Bonferroni correction (adjusted threshold $\alpha = 0.0009$), none of the comparisons remained statistically significant. Detailed results are included in Supplementary File B, Tables 4–7.

4. Discussion

The majority of people from our longitudinal survey of FGD experienced changes in gait over a 12-month period, with a substantial proportion reporting transient fluctuations. Self-reported motor and non-motor symptom severity remained relatively unchanged over 12-months compared to baseline, while standardised outcome measures showed improvement. Exploratory analyses found that greater baseline severity of functional seizures and greater severity of muscle rigidity at 12-months was strongly associated with worse gait outcomes at 12-months.

Most participants in our longitudinal survey reported changes in gait, with a notable proportion experiencing transient fluctuations, which were defined as gait-related improvements or deteriorations that resolved. These findings highlight the heterogeneity of gait trajectories over time: 23 % reported improvement, 30 % no change, 29 % deterioration, and 18 % with transient fluctuations. Of the 10 (18 %) cases experiencing transient fluctuations, seven reported an initial decline in gait that subsequently returned to previous levels, while the remaining three experienced transient improvements. This represents a novel finding with evidence of episodic fluctuations in FGD over time. These findings are based on small numbers and self-report, however, highlight the need for examination in larger, longitudinal studies. Understanding the nature and potential drivers of these fluctuations may offer important insights into underlying mechanisms and support tailored treatment.

Self-reported motor and non-motor symptom severity remained relatively unchanged over the 12-month period. In contrast, standardised outcome measures indicated improvements in anxiety, depression, fear of falling, kinesiophobia, quality of life, and participation in work and social activities. This suggests that while individuals' internal perceptions of symptom severity remained consistent, there were measurable gains in psychological well-being, fear-related movement behaviours, and social functioning. Importantly, although these standardised tools offer structured assessments, they are still based on self-report and thus remain subjective. The observed divergence between symptom severity ratings and outcome measure scores does not represent a simple distinction between objective and subjective data, rather it underscores the complex nature of self-perception in FND. Discrepancies between subjective and objective assessments have been widely documented in the FND literature. For example, one study found that patients with motor-FND often overestimate symptom severity relative to clinician ratings [26]. Another study comparing self-reported limb tremor duration to actigraphy over five days showed that individuals with Parkinsonian tremor over-reported tremor by 28 %, whereas those with functional tremor over-reported by 65 % [27]. These findings suggest altered self-perception in FND, contributing to a mismatch between patients' subjective experiences and structured assessments. While subjective reports may reflect personal perceptions and illness beliefs, structured outcome measures (even if self-reported) may focus more on participation and daily functioning. Using both types of measurements may offer a more complete view of health and recovery in FND. One additional potential explanation for the discrepancy between self-reported symptom severity and questionnaire outcomes could be that, over time and with access to potential treatments, respondents may have adapted to or become more accepting of their symptoms. However, it is important to note that the disconnect between impairments or symptoms and functional outcomes is not unique to FGD. This phenomenon has been observed in other neurological cohorts, such as stroke. Research has shown that changes in impairment severity do not always correlate directly with functional improvements, highlighting the complex nature of recovery and adaptation in neurological conditions [28].

Exploratory correlational analyses examined the association between symptom severity and gait decline. Greater baseline severity of functional seizures was strongly associated with worse gait outcomes at 12-months. This finding is consistent with our baseline survey findings, which found that functional seizures were significantly associated with dependent gait, that is, requiring assistance from another person to walk [8]. Similarly, increased muscle rigidity at 12-months was associated with worse gait outcomes, further implicating motor symptoms in ongoing mobility decline. It is unsurprising that muscle rigidity may be correlated with poorer gait outcomes, as it could impede efficient biomechanics of walking, in particular power generation for propulsion and the metabolic energy required for walking [29]. It remains unclear whether increasing muscle rigidity or seizure severity drives gait decline, or whether progressive gait limitations exacerbate symptom severity. These symptoms may represent modifiable targets for improving mobility in this population. However, these findings remain hypothetical and require further research and examination. Future longitudinal studies should incorporate repeated measurements, face-to-face clinician assessments, and a range of objective and subjective measurements, including wearable gait-tracking devices. These studies should also consider additional ecological measurements and extend participant follow-up periods to explain the directionality and underlying mechanisms of these relationships.

This study employed a longitudinal survey design with the aim of capturing repeated measurements over a 12-month period. As is common with longitudinal research, such designs are inherently vulnerable to participant attrition and dropout. In this study, substantial attrition resulted in particularly low response rates at the three- and six-month follow-ups, significantly limiting the ability to examine changes at these time points. We conducted a number of exploratory analyses, based on small numbers. Males and those with previous treatment were more likely to respond at 12 months, limiting the generalizability of the findings. Although each symptom was explained in detail using lay terminology for survey respondents, a potential limitation is the risk of symptom misinterpretation. All measures, including gait outcomes, were self-reported, which raises the risk of symptom misinterpretation and lack of clinician validation. However, it has been discussed in the literature that self-reported measures in FND cohorts may be more reflective of the patients subjective experiences of their symptoms and their perception of change, which may not be fully captured by clinician-rated or objective measures [15]. We did not examine the potential associations with gait outcomes in those with other comorbid, non-FND conditions, such as osteoarthritis or sciatica. Similarly, we did not identify if respondents accessed treatment over the 12-month period. As a result, the findings should be interpreted with caution.

In conclusion, this study, based on participant self-report, suggests that most individuals with functional gait disorder experience changes in gait over time, with greater severity of muscle rigidity and functional seizures potentially associated with gait deterioration. These findings,

although preliminary, support the consideration of both motor and non-motor symptoms as part of a broad multidisciplinary rehabilitation approach, that recognises the complex interplay between symptoms and disability. Future prospective cohort studies could examine the prognostic implications of these symptom-gait relationships to better guide clinical management.

Ethical compliance statement

We confirm that we have read the Journal's position on issues involved in ethical publication and affirm that this work is consistent with those guidelines. Approval was obtained from the ethics committee of University of Melbourne (Reference Number: 2021–22,778–23,936-3). The procedures used in this study adhere to the tenets of the Declaration of Helsinki. Informed consent was obtained from all participants prior to their inclusion in the study.

CRediT authorship contribution statement

Sara Issak: Writing – review & editing, Writing – original draft, Visualization, Validation, Supervision, Software, Resources, Project administration, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization. **Glenn Nielsen:** Writing – review & editing, Supervision, Formal analysis, Conceptualization. **Natalie A. Fini:** Writing – review & editing, Supervision, Formal analysis, Conceptualization. **Richard A. Kanaan:** Writing – review & editing, Supervision, Formal analysis, Conceptualization. **Gavin Williams:** Writing – review & editing, Supervision, Formal analysis, Conceptualization.

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Declaration of competing interest

The authors declare that there are no conflicts of interest relevant to this work.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jpsychores.2025.112408.

Data availability

The participant data that has been used for this survey is confidential and not publicly available due to ethical restrictions. Ethics approval from the University of Melbourne Human Research Ethics Committee and participant consent limits data access to the research team. Requests for access to anonymized data may be considered on a case-by-case basis and subject to additional ethics approval. Please contact sissak@student.unimelb.edu.au

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