

Outpatient Physical Therapy for Functional Neurological Disorder: A Preliminary Feasibility and Naturalistic Outcome Study in a U.S. Cohort

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Objective: Despite promising research and consensus recommendations on the important therapeutic role of physical therapy for motor functional neurological disorder (FND), little is known about the feasibility and potential efficacy of implementing physical therapy for this population in a U.S.-based outpatient program. Given health care system differences internationally, this is an important gap in the literature.

Methods: In this retrospective cohort study, the authors investigated the relationship between treatment adherence and clinical outcome in a hospital-based outpatient physical therapy clinical program. Medical records of 50 consecutive patients with motor FND referred from an FND clinical program were reviewed. The physical therapy intervention included a 1-hour initial assessment and the development of individualized treatment plans guided by published consensus recommendations. Statistical analyses included nonparametric, univariate screening tests followed by multivariate regression analyses.

Results: In univariate analyses, there was a statistically significant positive correlation between the number of sessions attended and clinical improvement. This relationship held when adjusting for demographic variables, concurrent psychogenic nonepileptic seizures, and other major neurological comorbidities. In a post hoc analysis of the subset of individuals with available gait speed data, posttreatment 10-meter gait speed times improved compared with baseline measurements. Baseline neuropsychiatric factors did not correlate with clinical improvement.

Conclusions: This preliminary, retrospective cohort study demonstrated that treatment adherence to a U.S.-based outpatient physical therapy program was associated with clinical improvement. Prospective observational and randomized controlled trials are needed to further optimize physical therapy for patients with functional motor symptoms in the outpatient setting.

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Physical therapy is a major therapeutic modality for individuals with motor functional neurological disorder (FND)/conversion disorder (1, 2). Patients with FND represent 10%–16% of referrals to neurology clinics (3, 4) and have impaired health-related quality of life similar to patients with other major neurological conditions (5, 6). Recent advancements in the assessment and management of FND emphasize specific examination signs that guide diagnosis, as well as therapeutic roles for education, physical therapy, occupational therapy, and psychotherapy (2, 7–11). To date, little is known about the feasibility of implementing an evidence-based outpatient physical therapy intervention for FND in the United States.

Physical therapy is a first-line treatment for individuals with functional limb weakness, gait disturbances, tremor, and dystonia, among other functional motor symptoms

(8, 12, 13). A systematic review identified 29 studies performed between 1970 and 2012 that evaluated the effectiveness of physical therapy (1). Treatment duration varied from days to months and was performed in distinct settings (inpatient versus day versus outpatient treatment). The therapeutic approaches used were diverse, and many studies had small sample sizes. Despite these factors, physical therapy proved to be successful for more than half of the patients, as demonstrated by a variety of outcome measures, including patient- and clinician-reported measures (1). The 2014 consensus recommendations for physical therapy in motor FND further standardized approaches (2). Four core guiding principles included education on FND, demonstration that normal movement can occur, retraining movement with diverted attention, and challenging maladaptive behaviors (2). Unlike conventional forms of

neurological physical therapy that focus on impairment-level treatment strategies (e.g., bed-level strengthening exercises), physical therapy for FND emphasizes task-based interventions (e.g., climbing stairs) and self-efficacy.

Physical therapy for FND has been studied across several clinical settings. In the hospital, 1- to 4-week stays with daily physical therapy (frequently coupled with other treatments) have demonstrated promising outcomes. In a retrospective study of an inpatient 1-week multidisciplinary program that included 3 hours of physical therapy, occupational therapy, and/or speech-language pathology in addition to cognitive-behavioral therapy (CBT) (14), more than 80% of participants reported being at least “much improved” posttreatment. However, enrollment criteria included failure to respond to outpatient treatment, and individuals with comorbid psychogenic nonepileptic seizures (PNES; also referred to as dissociative seizures) were excluded. From a practical perspective, insurance coverage difficulties and limited inpatient rehabilitation hospital expertise in FND within U.S. institutions restrict this approach from being widely adopted. Intensive outpatient physical therapy programs (eight sessions over 5 consecutive days) have also been studied, particularly in the United Kingdom, with 65%–72% of patients reporting symptom improvement (12, 15). While promising, this treatment is generally not available in U.S.-based physical therapy clinics, where patients are typically seen on a weekly basis.

In the present retrospective, naturalistic cohort study, we reviewed the medical records of 50 individuals with motor FND who were referred to outpatient physical therapy from a subspecialty FND clinical program. We investigated whether adherence to outpatient physical therapy was associated with symptom improvement and secondarily sought to characterize relationships between baseline neuropsychiatric factors and clinical outcome. Treatment adherence was hypothesized to positively relate to clinical outcome. In secondary analyses, longer illness durations, more psychiatric comorbidities, low expectation for recovery, and comorbid pain were hypothesized to negatively correlate with improvement.

METHODS

Institutional review board approval was obtained from the Partners Human Research Committee. Individual informed consent was not required for this study. We reviewed the medical charts of 50 consecutive outpatients (female, N=40; male, N=10) who were referred for physical therapy from a subspecialty FND clinical program at Massachusetts General Hospital between May 2016 and October 2018 (16, 17). Referred patients were diagnosed with motor FND using

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established DSM-5 diagnostic criteria supportive of a clinically established functional movement disorder (N=42; gait disorder, N=15, tremor, N=12,

dystonia, N=4, mixed, N=11) and/or functional limb weakness (N=21) (18). Thirteen patients had mixed motor FND. Additionally, seven individuals also had video EEG-documented PNES. Individuals who were specifically seen for one-time consultation and individuals with only suspected FND without positive rule-in signs on examination were excluded.

Physical Therapy Assessment and Intervention

Patients underwent an initial 1-hour assessment, including a clinical interview, focused neurologic examination, and mobility screening. All patients were seen by one physical therapist (J.B.M.), who was board-certified in neurologic physical therapy with 7 years of neurologic experience (with 4 years' experience treating FND). The therapist was mentored by a physical therapist (J.C.) with ≥30 years of neurologic therapy experience (13). To gauge an individual's understanding of the FND diagnosis and treatment motivation, patients were asked to respond to the questions listed below:

Understanding of diagnosis at start of care: “On a 0–10 scale, how well do you understand this diagnosis: 10 indicates full understanding and 0 indicates no understanding.”

Acceptance of diagnosis: “Of the following statements pick the one that best describes you: a) I do not think the diagnosis of FND is correct, I think there is something else wrong with me; b) I am willing to think about FND as a diagnosis for my problems but am still not sure it is correct; c) I think the diagnosis of FND is correct.”

Expectation for recovery at start of care: “On a 0–10 scale, to what extent do you expect to recover from this? 10 equals full recovery and 0 indicates no recovery.”

Patients were also provided with education on FND and given an opportunity to ask questions (2, 9). Early efforts were made to identify instances of normal movement and share this with patients, along with screening for triggers that worsened motor symptoms and strategies that aided symptom improvement.

Thereafter, treatments were individualized and modeled after the consensus recommendations, using at least a subset of the following core elements (2): ongoing education and encouragement of recovery, strategy identification and goal setting, functional strengthening emphasizing task completion, motor retraining activities with automatic movements or dual-tasking strategies, higher-level mobility training (e.g., dancing), functional reintegration instructions (e.g., how to optimally navigate community environments), and relapse prevention education. Sessions lasted 60 minutes,

and patients were encouraged to attend weekly sessions if possible.

For individualized treatment courses, the number of sessions was not predefined at the start of care. However, on the basis of our institutional experience with motor FND patients, as well as our treatment program partially modeled after the duration of treatment for published psychotherapy interventions for FND (19, 20), the physical therapist generally aimed for weekly sessions with an approximate target of 6–12 sessions. Interventions were extended for a variety of reasons, including continued improvement or coordinated discussion with other treatment team members. Patients also participated in other usual treatments (e.g., occupational therapy, CBT) as clinically indicated.

Outcome Measure

Data were analyzed over a 4-month period. The primary outcome was clinical improvement, defined as the ability to tolerate a final session asymptotically or demonstration of “marked improvement” in the final session. Marked improvement was defined as substantially enhanced ability to manage motor-based activities of daily living or near-complete symptom resolution at the final session. In addition, gait speed using a 10-meter walk test was collected for a subset of patients at the start and end of treatment.

Statistical Analysis

To evaluate the univariate relationship between the number of physical therapy sessions attended and clinical improvement, a Mann-Whitney U test was performed. Thereafter, a single multivariate logistic regression analysis investigated associations between clinical improvement and the number of physical therapy sessions attended while adjusting for age, gender, race, employment status, marital status, PNES, and concurrent major neurological diagnoses.

Secondary analyses investigated potential associations between baseline neuropsychiatric characteristics and clinical improvement. Nonparametric univariate screening tests were performed first (Mann-Whitney U or chi-square tests). Because there were no significant univariate relationships, second-level regression analyses were not performed.

RESULTS

In the motor FND cohort, the mean age was 47.6 years ($SD=16.5$), with an illness duration of 5.1 years ($SD=7.6$). There was a univariate relationship between the number of sessions attended and clinical improvement. Among those patients who improved ($N=17$), 10 were completely asymptomatic by their final session, and seven were markedly improved. Individuals who improved attended more sessions compared with those who did not (8.0 [$SD=4.1$]; session range, 2–16 versus 5.7 [$SD=4.2$]; session range, 1–19; $p=0.04$). This relationship remained statistically significant (odds ratio=1.22, 95% CI=1.01–1.47, $p=0.036$) in the logistic regression analysis that adjusted for age, gender, race,

TABLE 1. Multivariate logistic regression examining the relationship between clinical outcome and outpatient physical therapy participation among patients with motor functional neurological disorders ($N=50$)^a

Independent variable	Odds ratio	95% CI	p^b
Age (years)	0.96	0.90–1.03	0.26
Female	0.25	0.046–1.38	0.11
Caucasian	3.80	0.52–27.74	0.18
Employed (or full-time student)	1.46	0.20–10.46	0.71
Married	1.30	0.25–6.68	0.75
Comorbid major neurologic condition ^c	0.56	0.070–4.50	0.59
Psychogenic nonepileptic seizures	1.89	0.22–15.97	0.56
Number of physical therapy sessions	1.22	1.01–1.47	0.036

^a The dependent variable was symptom improvement ($N=17$) versus no improvement ($N=33$). A regression analysis demonstrated that marked clinical improvement was associated with treatment participation when adjusting for baseline demographic factors, psychogenic nonepileptic seizures, and major neurologic comorbidities.

^b Statistical significance is indicated in bold.

^c The presence of comorbid neurologic conditions included meningioma, astrocytoma, cervical dystonia, mild cognitive impairment/mild Alzheimer's disease, Parkinson's disease, tic disorder, epileptic seizures, and vascular malformation status postsurgery.

employment, marital status, PNES, and the presence of a major neurologic comorbidity (Table 1). It is noteworthy that 11 patients in the not-improved group and two patients in the improved group discontinued treatment before discharge. For the subset of improved patients with available baseline and posttreatment 10-meter walk test data ($N=8$), a post hoc Wilcoxon-signed rank test revealed significant improvements in posttreatment gait speed (baseline gait speed=0.83 ms [$SD=0.28$], posttreatment gait speed=1.2 ms [$SD=0.37$ ms], $p=0.012$).

Secondary analyses investigating univariate relationships between outcome and baseline neuropsychiatric factors revealed no statistically significant findings (Table 2). Individuals' understanding and acceptance of diagnosis, as well as their expectation for recovery, are summarized in Table 2.

DISCUSSION

This retrospective cohort study provides early-phase, preliminary support for the use of outpatient physical therapy as a treatment for motor FND. The data suggest that at least a subset of patients with motor FND benefit from approximately weekly outpatient physical therapy. One strength of this study is the inclusion of patients with PNES and comorbid major neurological disorders that have generally been excluded from previous studies (12, 14). An important unanswered question that this study lends data toward pertains to the feasibility and potential effectiveness of outpatient physical therapy for motor FND. Our data demonstrate a 34% improvement rate following an average of 6.5 [$SD=4.3$] physical therapy sessions. Current health care system limitations impede the ability of many U.S. centers to

TABLE 2. Baseline neuropsychiatric characteristics of patients with motor functional neurological disorders referred to outpatient physical therapy (N=50)^a

Characteristic	N	%	Test statistic ^b	p
Age at presentation (years) (mean±SD)	47.6	16.5	196.5	0.085
Illness duration (years) (mean±SD)	5.1	7.62	217.0	0.19
Gender (female)	40	80	1.43	0.23
Race (Caucasian)	41	82	0.68	0.41
Married	27	54	0.012	0.91
Employed (or full-time student) ^c	15	31	0.20	0.65
Emergency department visits in the past year	11	22	0.83	0.36
Lifetime depression	32	64	0.006	0.94
Lifetime anxiety	38	76	0.003	0.95
Lifetime posttraumatic stress disorder	9	18	0.002	0.96
Comorbid neurologic conditions ^d	8	16	0.34	0.56
Current cognitive complaints	15	30	0.51	0.47
Current pain	26	52	0.79	0.37
History of other functional somatic syndromes	25	50	0.80	0.37
Past alcohol misuse	5	10		
Functional weakness	21	42	0.007	0.93
Functional movement disorders	42	84	0.052	0.82
Psychogenic nonepileptic seizures	7	14	0.29	0.59
In occupational therapy at baseline	13	26	0.16	0.69
Receiving individual psychotherapy at baseline	19	38	2.44	0.12
Taking SSRIs/SNRIs at baseline	21	42	0.27	0.60
Number of medication allergies (mean±SD)	2.4	2.9	196.5	0.079
Number of medications at intake (mean±SD)	7.8	5.1	192.0	0.069
Number of sessions attended in 4 months (mean±SD)	6.5	4.3		
Understanding of diagnosis at the start of care ^e	7	2.7	133.5	0.15
Acceptance of diagnosis (yes/no response) ^f	33/7	83	2.34	0.13
Expectation for recovery at the start of care (mean±SD) ^g	6.3	3.4	112.5	0.070

^a Diagnoses of functional limb weakness and functional movement disorders were not mutually exclusive. SSRIs=selective serotonin reuptake inhibitors, SNRIs=serotonin-norepinephrine reuptake inhibitors.

^b Test statistic refers to Mann-Whitney U or chi-square tests used to evaluate the relationship between baseline clinical characteristics and clinical improvement.

^c Data were missing for two participants.

^d The presence of comorbid major neurologic conditions included meningioma, astrocytoma, cervical dystonia, mild cognitive impairment/mild Alzheimer's disease, Parkinson's disease, tic disorder, epileptic seizures, and vascular malformation status postsurgery.

^e Data were missing for 11 participants.

^f Data were missing for 10 participants. Patients were coded as "yes" if they thought their diagnosis was correct or were willing to think about it as potentially correct. Participants who felt that their diagnosis was not correct were coded as "not accepting."

^g Data were missing for 12 participants.

implement intensive (daily) FND-specific outpatient physical therapy programs. Additionally, access to inpatient programs is limited by the small number of specialized rehabilitation programs, insurance coverage, and overall health care expense. This makes it necessary to perform prospective observational and randomized controlled trials in the outpatient setting in order to optimize physical therapy parameters for FND.

Selecting appropriate outcome measures for individuals with FND remains an ongoing challenge. We characterized improvement dichotomously (asymptomatic or markedly improved versus not improved) on the basis of motor symptoms. This approach likely had low sensitivity, limiting our ability to identify those patients who made improvements while remaining symptomatic, which may have also limited our ability to appreciate relationships between baseline clinical factors and clinical improvement. However, it is noteworthy that the literature on prognostic factors does not incorporate newer care models, suggesting that more work is needed to determine relevant clinical factors predicting outcome (21, 22). Careful selection of sensitive, clinically relevant outcome measures will be critical when considering clinical trial designs to investigate the effectiveness of physical therapy for motor FND. FND outcome measures fall into several domains, including patient-reported questionnaires, clinician- and patient-rated Likert-type scales (19), clinician-rated symptom severity measures (23), and motor performance tasks (24). Notably, recent FND studies used gait speed as an outcome measure (12, 15), which is consistent with physical therapy practice guidelines (25).

This study has several limitations, including its retrospective nature, modest sample size, lack of patient self-report or other clinician-rated outcome measures, and lack of follow-up data to gauge the sustainability of improvement. The number of sessions attended is only a proxy measure of treatment adherence, and patients received individualized treatments that were not standardized. The presence of a patient-reported symptom severity scale might have added greater clarity to factors contributing to outcome in an outpatient setting. Our cohort was relatively homogenous in terms of their generally positive understanding and acceptance of their diagnosis, as well as their expectation for recovery. The reduced variability in these clinical scores likely limited the statistical power to examine correlations between the range of acceptance values and clinical improvement. Nonetheless, this study highlights improvements in a mixed cohort with concurrent PNES or neurologic comorbidities and identifies the need for future prospective studies incorporating validated outcome measures and psychometric assessments of the spectrum of predisposing vulnerabilities and perpetuating factors. Future research could help to identify which patients optimally benefit from this outpatient care model and may help to better explain how acceptance and understanding, as well as expectation for recovery, influence improvement.

In conclusion, this preliminary study provides evidence that treatment adherence to approximately weekly outpatient physical therapy sessions using consensus recommendations is associated with short-term improvement. More research is needed to optimize outpatient physical therapy for motor FND.

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