



Efficacy of a 5-day, intensive, multidisciplinary, outpatient physical and occupational therapy protocol in the treatment of functional movement disorders: A retrospective study

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ABSTRACT

Background: The use of rehabilitation services has been shown to be beneficial for patients with functional movement disorders (FMD). However, there is great variability in the type of rehabilitation services utilized. In the present study we aimed at determining the efficacy of an intense outpatient physical rehabilitation program as a treatment modality for patients with FMD.

Methods: Eighteen participants underwent treatment in a specialized outpatient rehabilitation program utilizing a multidisciplinary approach for the treatment of FMD. Participants completed a series of tests on day one and day five of the program.

Results: Results indicated statistically significant improvements in all but one motor and gait outcomes in patients with functional movement disorders treated with physical rehabilitation. **Conclusion:** These results provide support for the continued use of physical and occupational therapy for functional movement disorder patients. Further research is needed to fully validate these findings and there remains a need for further study into multidisciplinary approaches that may be even more efficacious.

1. Introduction

Functional neurologic disorders, including functional movement disorders, are relatively common [1]. Unfortunately, due to their incompletely understood pathophysiology and varied presentation, functional movement disorders have historically been difficult to diagnose and treat [2,3]. However, physical rehabilitation has been shown to be a useful treatment [4,5]. Whereas most protocols utilize an inpatient approach [6], there is growing interest in outpatient approaches [7], which may be more cost effective and logistically more feasible. The aim of our study was to utilize a wide spectrum of validated scales to objectively measure the efficacy of a 5-day, intensive, multidisciplinary, outpatient physical rehabilitation program in the treatment of patients with functional movement disorders.

The phenomenology of functional movement disorders varies widely. Functional movements can include tremors, dystonia,

myoclonus, gait abnormalities, parkinsonism, facial movements, speech abnormalities, and dyskinesias [8]. In addition, although less common, functional tics and functional palatal myoclonus have been reported [8]. Diagnosis is clinical, though it can be supported by neurophysiological testing, and is made by excluding organic causes and looking for characteristic features on examination [8]. These findings can include variability (e.g. of phenomenology, frequency, direction, or body location), distractibility (i.e. decrease or cessation of movements when focusing on mental or motor tasks with the unaffected limb), entrainability (i.e. limb affected by functional movement adopts the same frequency of a repetitive movement in an unaffected limb) and suggestibility (i.e. activation or suppression of movements with the power of suggestion) [8–10].

Studies have suggested a neural basis for functional movements disorders. Interestingly, functional MRI (fMRI) imaging in patients with functional movements have revealed alterations in brain areas involved

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in planning, execution, and interpretation of movement [11], as well as decreased connectivity between the right temporoparietal junction and bilateral sensorimotor regions [12]. Dysfunctional emotional processing may also play a role [13,14].

Research has shown that restorative therapies, like physical and occupational therapy, can improve functional movement symptoms [4,5,15]. This multidisciplinary rehabilitation approach may work by changing the processing of aberrant and complex motor programs [16]. The purpose of this study was to retrospectively examine the efficacy of a multidisciplinary team approach, including physical and occupational therapy, in the treatment of individuals with functional movement disorders. Varying functional outcome measures were utilized to measure mental and physical well-being, functional independence, and quality of life.

2. Materials and methods

2.1. Study participants

The 18 participants in this retrospective study were subjects who underwent treatment in a specialized outpatient rehabilitation program, utilizing a multidisciplinary approach, for the treatment of FMD. Patients in the study completed the rehabilitation program between January 2019 and April 2021. The inclusion criteria were a clinical diagnosis of functional movement disorder made by a neurologist, that the patient was accepting of this diagnosis and that the patient was ≥ 18 years of age with no criteria for sex or ethnicity. Exclusion criteria included: patient age ≤ 17 years and pain as the primary complaint/cause of disability. Approval was obtained from Michigan State University Institutional Review Board, Study Number 00004463, and informed consent forms were signed by all participants in the study.

2.2. Study design

The study was retrospective in nature. Participants in the study attended an outpatient therapy program at The Recovery Project, LLC, in Lansing, Michigan. The program consisted of 5 consecutive days of outpatient therapy including: physical therapy, occupational therapy, speech therapy and meditation/mindfulness practice. Prior to admission to the program, clinical diagnosis of functional movement disorder was obtained by a neurologist. Of the 10 referring neurologists to this program, eight were movement disorders specialists. Participants completed a series of tests on day one and day five of the program including: Six Minute Walk, Berg Balance Scale, Timed Up and Go, 30 Second Sit to Stand, Patient Specific Functional Scale, 30 Second Arm Curl Test, Canadian Occupational Performance Measure and the Box and Block test. Treatment consisted of 90 min of physical therapy, 90 min of occupational therapy, 30 min of meditation/mindfulness practice and 60 min of speech therapy. It should be noted that speech therapy was only included when clinically warranted. Therapeutic interventions focused on two main principles: autonomic regulation and motor retraining. Therapeutic strategies like diaphragmatic breathing and other vagal nerve stimulation techniques were used to increase parasympathetic activity and thus better regulate the autonomic nervous system. Motor retraining was customized to meet the individual's needs and focused specifically on completion of functional tasks by breaking movement patterns down to the simplest form required for normalized movement, while incorporating mental imagery to improve performance success rate.

2.3. Measures

Measures utilized in this study were the Six Minute Walk Test whereby the patient ambulates at comfortable pace for six minutes [17,18]. Additional measures included the Berg Balance Scale [19,20], the Timed Up and Go [21], and the 30 Second Sit to Stand, which is a

measure of functional lower extremity strength in adults and was performed from a 17" chair without arms. Other tests utilized were the Patient Specific Functional Scale, the 30 Second Arm Curl Test, the Box and Block Test for unilateral gross manual dexterity [22], and the Canadian Occupational Performance Measure for perceived occupational performance in the areas of self-care, leisure, and productivity.

2.4. Statistical analysis

Statistical analyses were conducted using the Statistical Package for Social Sciences SPSS (v.26). Descriptive statistics, including means and standard deviations, were conducted to summarize the sample characteristics and study variables. Paired-sample *t*-tests were conducted to determine if there were statistical differences in each of the study outcomes from intake to discharge. A *p*-value < 0.05 was considered significant.

3. Results

A total of 18 patients were included at intake. At discharge, all 18 patients were assessed and results were available for almost all tests before and after intervention for the majority of patients. Patient age ranged from 21 to 71 years ($M = 46.67$, $SD = 15.63$), and all but one patient was female. Most of the tests, other than the Timed Up and Go test, changed significantly in the desired direction from intake to discharge as can be seen in Table 1. Table 1 shows the means and standard deviations for each metric utilized, as well as the paired samples *t*-test results, where a *p* value < 0.05 is considered statistically significant.

Correlation analyses with all the measures suggests that there were no statistically significant correlations between the motor scales and performance perception nor satisfaction at baseline. However, there were strong, significant correlations between the Patient Specific Functional Scale for both performance perception ($r(17) = 0.85$, $p < .001$) and satisfaction at discharge ($r(16) = 0.80$, $p < .001$).

4. Discussion

Our results indicate significantly improved motor and gait outcomes in patients with functional movement disorders treated with a 5-day, intense, multidisciplinary, outpatient physical rehabilitation program. So far, the majority of physical therapy protocol employed either intense inpatient or low intensity outpatient physical therapy approaches. Improvement was noted at discharge in nearly every measured domain except for the Timed Up and Go test. This could be attributed to low test sensitivity or low number of patients included with gait disorders; as few as 4 participants presented with gait disturbances as their main symptom with 12 participants reporting tremor to be their main symptom during the initial evaluation. Furthermore, the Box and Block Test and 30 Second Arm Curl Test demonstrated statistically significant improvement from intake to discharge in functional movement disorder patients presenting with lateralized symptoms. The use of objective and validated scales lends credence to previous research showing that physical rehabilitation is indeed beneficial for the motor and gait manifestations of functional movement disorders [4,5].

In addition to objective motor and gait improvement, our results also indicate improved patient perception of functional performance. We argue that this is particularly important because patients with functional neurologic disorders have significant physical and mental burden from their disease. In fact, one study has suggested that those with functional neurologic disease have worse physical and mental health than those with organic disease [23]. Because patients with functional movement disorders often have poor insight at the time of diagnosis [8], interventions that lead to positive alteration of patient perception are of importance.

Although physical therapy has been shown to have great benefits,

Table 1Means and Standard Deviations and Paired Samples *t*-test for All Measures at Intake and Discharge.

	Intake			Discharge			<i>t</i>	<i>df</i>	<i>p</i>
	N	M	SD	N	M	SD			
Six Minute Walk Test (in ft)	17	1025.06	424.36	17	1237.24	414.91	−4.14	16	0.001
Berg Balance Scale	18	43.89	15.80	18	54.89	2.06	−3.13	17	0.006
Timed Up and Go (in sec)	17	9.80	5.24	18	10.21	10.02	1.29	16	0.216
30 Sec Sit to Stand (in repetitions)	17	11.53	6.09	17	15.18	7.38	−3.93	16	0.001
Patient Specific Functional Scale (numeric rating scale)	18	3.34	1.50	18	7.16	2.04	−9.06	17	0.000
Box and Block Test (Right) (number of blocks)	17	49.18	15.20	17	59.59	14.05	−3.96	16	0.001
Box and Block Test (Left) (number of blocks)	17	52.65	15.36	17	60.24	14.28	−4.92	16	0.000
Canadian Occupational Performance Measure (Performance) (numeric rating scale)	18	3.53	1.66	17	7.30	1.95	−7.61	16	0.000
Canadian Occupational Performance Measure (Satisfaction) (numeric rating scale)	17	3.06	1.82	16	7.25	2.66	−5.87	15	0.000
30 Second Arm Curl Test (Right) (repetitions)	18	21.22	9.64	18	26.06	8.80	−4.56	17	0.000
30 Second Arm Curl Test (Left) (repetitions)	18	21.28	10.58	18	25.44	10.54	−3.25	17	0.005

future work should consider a multidisciplinary approach to treating functional movement disorders [16,24]. Cognitive behavioral therapy and other forms of psychotherapy have demonstrated efficacy and may be a useful adjunct to physical rehabilitation [24–26]. In addition, pharmacotherapy with antidepressants may be useful in some patients [27]. Future research on the benefits of combining multiple therapies is needed.

Our study has several limitations. First, there was a low number of participants and limited representation of male patients. Second, although there was an attempt to keep long term outcome data, many follow up visits were missed as the implementation of this treatment protocol coincided with the COVID-19 outbreak. This prohibited any meaningful statistical interpretation for long term efficacy. Additionally, we collected mostly motor related metrics and limited quality of life ones, with exception of the Canadian Occupational Performance Measure. During the course of our study recommendations for outcome measures in functional neurological disorders were published [28]. A longitudinal, prospective, controlled study utilizing validated measures such as the Short Version of the Functional Movement Disorder Rating Scale (S-FMDRS) would broaden our understanding of the short-term and long-term benefits of rehabilitation in functional movement disorders [29]. Such a study may also offer clues regarding optimal duration of physical rehabilitation for treatment of functional movement disorders. Furthermore, head-to-head studies could be considered, comparing inpatient with outpatient approaches. Finally, in our study, speech therapy, although delivered as needed for functional speech impairments, was not quantitated and followed up with specific outcome measures.

5. Conclusions

Functional movement disorders have historically been difficult to treat, but the findings presented here suggest that a combination of physical and occupational therapy, along with speech therapy, are a useful and effective avenue of treatment. These results provide support for the continued use of physical and occupational therapy for functional movement disorder patients. Further research is needed to fully validate these findings and there remains a need for further study into multidisciplinary approaches that may be even more efficacious.

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Declaration of Competing Interest

The authors declare no conflict of interest.

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