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Self-management rehabilitation and health-related quality of life in Parkinson's disease: A randomized controlled trial

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Abstract

The purpose of this randomized controlled trial was to determine if increasing hours of self-management rehabilitation had increasing benefits for health-related quality of life (HRQOL) in Parkinson's disease beyond best medical treatment, if effects persisted at two and six months follow-up, and if targeted compared to non-targeted HRQOL domains responded more to rehabilitation. Participants on best medication therapy were randomized to one of three conditions for six weeks intervention: 0 hrs of rehabilitation; 18 hrs of clinic group rehabilitation plus 9 hrs of attention control social sessions; and 27 hrs of rehabilitation, with 18 in clinic group rehabilitation and 9 hrs of rehabilitation designed to transfer clinic training into home and community routines. Results (N = 116) showed that at six weeks there was a beneficial effect of increased rehabilitation hours on HRQOL measured with the Parkinson's Disease Questionnaire-39 summary index ($\eta^2 = .23$, CI = .05 – .40, $p = .01$). Benefits persisted at follow-up. The difference between 18 and 27 hrs was not significant. Clinically relevant improvement occurred at a greater rate for 18 and 27 hrs (54% improved) than for 0 hrs (18% improved), a significant 36% difference in rates (95% CI = 20% to 52% difference). Effects were largest in two targeted domains: communication and mobility. More concerns with mobility and activities of daily living at baseline predicted more benefit from rehabilitation.

Keywords

Clinical trials Randomized controlled (CONSORT agreement); Health-related Quality of life; Parkinson's disease/Parkinsonism; Rehabilitation

Health-related quality of life (HRQOL) is one's perceived health and well-being in personally valued domains of daily life.^{1,2} Parkinson's disease (PD) symptoms compromise HRQOL by making it difficult to participate in valued activities and roles of home and

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community life. Yet individuals who feel mastery over life activities and maintain participation in them experience less depression and more well-being.^{3,4} Effective management of PD begins with considering the person's HRQOL and promoting a sense of control in valued life domains that realistically are within the person's capacity to influence.⁵⁻⁶ Our meta-analyses of previous studies found rehabilitation to improve performance in mobility and self-care activities in 25% more individuals with PD compared to control conditions.⁷⁻⁹ Recent studies have strengthened the evidence that rehabilitation benefits HRQOL.¹⁰⁻¹² Few of these studies implemented well-defined interventions and tested effects with randomized controlled trials, and fewer yet attempted to test varying intensities of rehabilitation.¹³ Consequently we developed a specific, best practice rehabilitation intervention and used a randomized-controlled trial to test the effects of differing rehabilitation intensities on health-related quality of life.

An interdisciplinary team of physical, occupational, and speech therapists implemented methods designed to improve HRQOL in community dwelling adults in early to middle stages of PD by fostering their ability to manage daily life functioning in valued domains.¹⁴⁻¹⁵ The team taught the participants how to observe their own behavior, identify strengths and problems in mobility, communication and activities of daily living, set realistic goals to manage these problems, and implement action plans.^{6,16-17} Individuals practiced evidence-based physical exercises and activity-modification strategies that could be incorporated into daily routines.¹⁸⁻²⁷

The primary objective of this study was to determine if self-management rehabilitation promoted HRQOL beyond best medical therapy. It was hypothesized that HRQOL would be more positive the more intense the self-management rehabilitation, from 0 to 18 to 27 hrs of rehabilitation over six weeks. Previous clinical experience and research suggested that two clinic group sessions per week over a six-week period would be more effective than no rehabilitation.^{7,8,22} Little was known about the degree to which more intensely individualized rehabilitation would increase effectiveness. To develop evidence in this area, the current study tested 18 hrs consisting of two weekly clinic group sessions against 27 hrs consisting of two weekly clinic group sessions and a third weekly session in the home and community. This third session was expected to consolidate the learning from the clinic sessions with the participant's own routines and physical spaces of daily living.^{18,20,24,25} The 27 hrs condition intensified the delivery of rehabilitation beyond that of the 18 hrs condition by combining nine additional hours of intervention, with the delivery of individual versus group intervention, and direct training in the home rather than the clinic. More than 27 hrs of intensity was not attempted in order to avoid excessively burdening participants and potentially compromising rehabilitation adherence and time for participating in healthy home routines.

The first secondary objective of this study was to determine if rehabilitation outcomes persisted at two and six months follow-up. Since self-management rehabilitation teaches strategies and skills that should continue to help participants manage minor changes in their life as the chronic condition progresses, we anticipated that a beneficial effect would persist for up to six months follow-up, despite little evidence for this rehabilitation effect in PD. The other secondary objective was to determine if rehabilitation-targeted domains of mobility, communication, and activities of daily living were more responsive to the intervention than were non-targeted areas such as emotions, stigma, social support, and cognitive ability. Since training effects are greatest for specific skills that are trained, the intervention's focus on physical daily functioning was expected to produce greater HRQOL gains in physical rather than in socio-emotional and cognitive functioning.²⁸

Methods

Participants recruited from the Parkinson's Disease and Movement Disorders Center of the Department of Neurology at Boston Medical Center and local support groups met the following criteria: (1) Diagnosis of idiopathic PD by a movement disorder specialist (MSH), utilizing the UK Parkinson's Disease Society Brain Bank clinical diagnostic criteria; (2) Modified Hoehn and Yahr stage 2, 2.5 or 3 when "on;" (3) Age ≥ 40 years; (4) Mini-Mental Status Exam score > 26 ; (5) Geriatric Depression Scale score ≤ 20 ; (6) Stable dose of anti-parkinson medications for at least two weeks prior to entering the study; (7) No other form of rehabilitation therapy within two months before participation in study; (8) Ability to walk without physical assistance; (9) Ability to understand, and to communicate with personnel; (10) Home setting within travel distance to the site of the intervention; (11) No other severe medical disorders that would interfere with movement or ability to participate in the intervention; (12) Interest in participating and ability to give informed consent. Participants had not received surgical interventions such as deep brain stimulation for PD. This study was approved by the institutional review boards at Boston Medical Center and Boston University.

Study design

Participants (N=117) were randomly allocated to one of the three intensity of rehabilitation conditions. Random assignment was stratified according to wave of participant entry into the study over a two year period, with nine sequential waves of entry consisting of 9 to 19 participants per wave. This design allowed individualized rehabilitation in groups of approximately 4 participants each (range = 2 – 6, median and mode = 4) during clinic sessions. A statistician provided computer generated random numbers. An investigator (TE) not involved in data collection or intervention implementation unsealed condition assignments and allocated each participant to the condition once consent, screening and baseline assessment were completed.

A neurological medical team (MSH and CT) conducted the medical history and screening. A team of trained evaluators who did not participate in intervention assessed background variables including education, marital status, and whether living alone or with others. They assessed HRQOL at baseline, immediately post intervention at six weeks, and at two months and six months follow-up while participants were in the "on" state. The current study reports HRQOL results, the primary outcome planned for the trial. Evaluators assessed additional variables, including walking performance, lifestyle activity, functional impairment, personality, and emotional behavior, to create a parent database for other studies. The results of walking measures recently were published.²⁹

All attempts were made to keep evaluators blinded to condition assignment. However, unblinding occurred at an average rate of 2 out of every 13 participants (14% unblinding), usually when participants revealed their assignment. Results were the same when including or excluding participants unblinded to the evaluator, therefore these participants were retained in analyses.

Intervention

Participants remained on a stable dose of Parkinson's medications from at least two weeks prior to enrollment through the six month study duration. Medication changes were made if deemed medically necessary, and out of 115 participants who completed post assessment, only 5 had a change. A clinical nurse specialist in movement disorders (CT) monitored medication adherence in all participants via telephone calls half way through the intervention, at its completion, and at the two month and six month follow-up.

Participants assigned to the 27 hrs condition engaged in 4.5 hrs of self-management rehabilitation per week in two 1.5 hr group clinic sessions and one 1.5 hr individual home or community session to transfer self-management skills to the locations of daily living. Therapists were trained and supervised for consistency (by TE) in the standardized, manualized, and interdisciplinary intervention. A physical therapist led all sessions and an occupational therapist and speech and language therapist each participated in half of the sessions, assisted by therapy students. Participants received manuals with detailed photographs of exercise routines. Each group clinic session involved physical exercises, speech exercises, functional training, and a discussion about self-management strategies (Table 1). After assessing their problems in personally valued domains of mobility, communication and daily life activities, participants would develop realistic action plans to reduce these problems. Participants were taught to problem solve by asking themselves a key question: "Can I change something about myself, about the task, or about the environment to improve my ability?" For example, they could elect to increase their speech volume (change self) by doing speech exercises, or to change their method of rising from a chair (task) to improve mobility function, or to wear a coat with silk rather than fleece lining (environment) to improve their ability to put on the coat. The intervention team helped them translate new strategies into daily habits.

Participants assigned to the 18 hrs condition engaged in 3 hrs of self-management rehabilitation per week in two 1.5 hr group clinic sessions designed to be equal to, but conducted separately from the clinic sessions of the 27 hrs condition. They did not receive the weekly 1.5 hr of transfer-of-training session in the home or community. Instead they received a weekly 1.5 hr student-facilitated social group session in the clinic, which was intended to control for the extra attention that participants received in the 27 hrs condition. The described purpose of this session was to "get to know one another outside of having Parkinson's disease." It involved social ice-breaker activities, refreshments, conversation, and sharing of hobbies and interests.

Health-related quality of life outcome measure

The Parkinson's Disease Questionnaire-39 (PDQ-39) was verbally administered with no caregiver present. The primary intervention effect was measured by the summary index score, which is an average of eight domain scores: mobility, activities of daily living, emotional well being, stigma, social support, cognitions, communication, and bodily discomfort. Analyses also were conducted with the eight domain scores. A higher index or domain score indicates more self-perceived frequency of quality of life and health problems in the past month that are due to the disease, with 0 indicating *never a problem* and 100 *always a problem*. The PDQ-39 was developed to measure life concerns identified by people with PD.³⁰ Questions assess a variety of health-related constructs, including ability (e.g., *difficulty dressing*), participation in the community (e.g., *been confined to the house more than you would like*), emotion (e.g., *felt worried about your future*), social responses (e.g., *felt ignored by people*), and cognitive and physical symptoms (e.g., *had distressing dreams or hallucinations*, and *had painful muscle cramps or spasms*). The index and domain scores (with the exception of *social support*) have adequate internal consistency, test-retest reliability, and responsiveness.³¹⁻³² Construct validity is demonstrated by convergent correlations with other HRQOL and health status measures, self-reported severity of PD symptoms, depression, optimism, and satisfaction with health care.³³⁻³⁴

Sample size determination

Based on available evidence for the difference between no rehabilitation and rehabilitation, we predicted a medium size of effect for the hypothesis of a linear increase in HRQOL improvement with increasing intensity of rehabilitation.^{7-8,22} There was little evidence for

the difference between two different rehabilitation intensities for PD outcomes. A total sample size of 120 participants (40 per condition) was estimated to demonstrate a medium effect size ($f = .25$) with a Type II error rate of approximately .20 (power = .80) and Type I error rate of $\alpha = .05$.^{35,36}

Data analysis

All data were normally distributed and met the assumptions for parametric testing. Differences between conditions at baseline were tested with chi-squares for nominal data and one-way ANOVA's for ordinal and continuous data. Effects of intervention were tested through an intention-to-treat analysis. For the 13 individuals who failed to complete all assessment periods, scores from the most recent assessment were carried forward to replace missing data. The overall effect of rehabilitation intensity on the PDQ-39 summary index was tested via repeated measures ANCOVA with one between-condition factor (three different rehabilitation intensities), one within-condition factor (three measurement times: post intervention, 2 months, and 6 months), and one covariate (baseline summary index). An effect size *eta* was calculated from this overall analysis to demonstrate the degree of the general nonlinear relationship between hours of rehabilitation and the PDQ-39 summary index.^{37,38} Contrast analyses using a correlational approach tested the primary hypothesis that the average baseline-adjusted index scores at post intervention would covary with the hours of self-management rehabilitation such that with more hours, the less problems in HRQOL.³⁹ Contrast analyses were also conducted for each follow-up period and for each PDQ-39 domain score. An effect size *eta* was calculated from each contrast analysis to demonstrate the degree of linear relationship between hours of rehabilitation and the PDQ-39 scores. This *eta* is interpreted as a product moment correlation.^{37,39} Paired comparisons of the three rehabilitation intensities were examined with Fisher's LSD test. These tests were conducted only when contrast analyses were significant at the .05 level and with the purpose of describing patterns of differences.⁴⁰

Results

Recruitment occurred between August 2003 and September 2005. Of 313 individuals who were eligible to participate, 117 met inclusion criteria, were randomized, and completed baseline assessments, 114 completed the intervention period and were assessed immediately post intervention, 108 participated in assessments at two months follow-up, and 107 at six months follow-up, with a total of 103 completing all assessment periods (see Figure 1). One person was withdrawn from the analyses when diagnosis changed from idiopathic PD. Intention-to-treat analyses involved 116 participants who completed baseline assessments. Compared to the 107 participants who finished the trial, the nine participants who dropped out were not significantly different in terms of duration of PD ($p = .99$) or Hoehn and Yahr stage of severity ($p = .62$). Six failed to complete for medical reasons. Intervention adherence was high. Out of 12 clinic rehabilitation sessions possible, 85.7% of the participants in the 18 hrs condition and 92.1% of those in the 27 hrs condition attended at least 10 sessions (median = 11, mode = 12, range = 5 –12). Out of six social or home and community sessions possible, 85.7% of the participants in the 18 hrs condition and 100% of the participants in the 27 hrs condition attended at least five sessions (median = 6, mode =6, range = 2 – 6). There were no important adverse events. Baseline scores on participant descriptive variables and the PDQ-39 were not significantly different across the rehabilitation intensity conditions ($p > .05$) except for the PDQ-39 social support domain ($p = .05$) (Table 2). Participants in the 0 hrs condition reported less social support problems than participants in the 18 hrs ($p = .02$) or 27 hrs conditions ($p = .07$).

Efficacy of interdisciplinary self-management rehabilitation on overall HRQOL

Repeated measures ANCOVA with the intention-to-treat sample ($N = 116$) demonstrated that there was a main effect of intervention on post and follow-up PDQ-summary index scores, adjusted for baseline ($F(2, 112) = 3.98, p = .02$). This effect was of a medium magnitude ($\eta^2 = .26$). Findings were similar when including only the 107 participants who finished the trial in the analysis ($F(2, 103) = 4.52, p = .02$). Rehabilitation intensity did not interact with post and follow-up periods ($p = .81$) demonstrating that the effects of rehabilitation at post intervention persisted, on the average, across the post intervention and follow-up periods (Figure 2). Contrast analyses found the summary index to covary with rehabilitation intensity in the expected direction at post test ($F(1, 112) = 6.48, p = .01$) (Table 3). Paired comparisons showed that these findings were due primarily to improvement between 0 and 18 hrs ($p = .03$) and between 0 and 27 hrs ($p = .02$). With increasing rehabilitation intensity there was a concomitant improvement in HRQOL of a medium magnitude ($\eta^2 = .23$). The difference between 18 and 27 hours was not of a significant magnitude ($p = .89$).

We compared the percentage of individuals whose overall HRQOL scores improved when receiving rehabilitation (18 or 27 hrs) with those whose scores improved when receiving no intervention (0 hrs). A decrease of at least 5.39 points on the summary index (a reduction in problems) was used as the criterion for clinically relevant improvement.³² Rates of improvement were greater for rehabilitation versus no rehabilitation at post and six months follow-up in particular, with a smaller difference at two months. At immediately post test, 54% of participants in rehabilitation were improved versus 18% receiving no rehabilitation. The difference of these two rates is 36%, the *absolute benefit increase* due to rehabilitation (ABI, 95% CI = 20% to 53%; $\chi^2(1) = 14.35, p < .0001$).⁴¹ The inverse of the ABI yields the number of patients that clinicians need to treat (NNT) to achieve clinically relevant improvement for at least one patient. At post test the NNT was 3 (95% CI = 2 to 6). At two months follow-up, 34% of participants in rehabilitation were improved versus 20% of those who did not receive rehabilitation (ABI = 14%, CI = 0% to 31%; $\chi^2(1) = 2.55, p = .11$; NNT = 8, CI = 4 to infinity). At six months, 38% who received rehabilitation were improved versus 10% of those who received no rehabilitation (ABI = 28%, CI = 14% to 43%; $\chi^2(1) = 10.21, p < .001$; NNT = 4 (CI = 3 to 8)).

Outcomes for specific domains of HRQOL

The domains ordered from the most to least favorable response to rehabilitation intensity at post intervention (from contrast analysis results shown in the last column of Table 3) were communication ($p = .04$), mobility ($p = .08$), activities of daily living ($p = .14$), bodily discomfort ($p = .25$), cognitions ($p = .27$), stigma ($p = .36$), emotional well-being ($p = .40$), and social support ($p = .72$). The first three domains in this ordering were targeted by the intervention. At two months follow-up, communication ($p = .03$) had the strongest response, while at six months, mobility ($p = .03$) had the strongest response.

Discussion

People with PD responded to a six-week program of self-management rehabilitation with HRQOL benefits beyond best medical therapy. The medium magnitude of the intervention effect was similar to those found in preliminary studies, which suggests a robust positive response to rehabilitation across different samples.^{7-8,22} This effect translates into clinically relevant improvement rates for rehabilitation that can be anticipated to be 20% to 53% greater than for medication alone (the 95% CI for post ABI). A therapy team can predict that it will have to treat approximately two to six patients with PD before achieving clinically relevant improvement in the HRQOL of at least one patient (the 95% CI for post NNT).

Greater improvement rates continued for rehabilitation relative to no rehabilitation at two and six months follow-up, yet the difference between those rates had declined, which likely indicates continued decline into the future. Programs must be designed and tested to determine how best to reinforce self-management gains and sustain HRQOL of patients and family caregivers as the disease progresses.

The differences in outcomes between 18 and 27 hrs were in the expected direction but were not significant, possibly due to limitations in the study design. There may have been insufficient study power, or more than a nine hour difference may be needed between condition intensities. Alternatively, maximum benefits may emerge consistently within 18 hrs of intervention in a clinical setting.

Another explanation is that the social sessions added to the 18 hrs of self-management rehabilitation may not have served the intended control purpose and were active elements of intervention. Descriptive patterns in the PDQ-39 domain scores imply that individuals receiving physical intervention in the home and community sessions (27 hrs) received more benefit in physical areas of function, while those who spent additional hours in talking with one another about their “normal” lives in the social session (18 hrs) received more benefit in psychosocial areas of function. These patterns are consistent with numerous studies that have shown task-specific responses to the content of rehabilitation.^{7,22,28} When this study was designed there was little evidence for determining how to gradate and powerfully differentiate two PD rehabilitation conditions or for determining a sample size that statistically would discriminate them. The outcomes of this study can guide sample size determination and the development of study designs aimed at documenting the minimal frequency, intensity, and duration of intervention required for achieving HRQOL benefits. In the future, intensity could be conceived as number of targeted HRQOL domains instead of rehabilitation hours.

A limitation of this study was that it did not differentiate the active contributions of rehabilitation methods. For example, it is not known the degree to which the problem-solving training and the physical practice of skills differentially contributed to the outcomes. One of the theoretical premises of the self-management approach is that providing participants with a “toolbox” of daily living strategies and skills to be used as desired and needed would enhance a sense of personal control, activate self-direction, and deepen satisfaction with daily activities.^{6,14–17} Well-designed measures are needed that would allow an investigation of the differential impact of the tools of PD self-management on 1) feelings of ability to manage specific life domains, 2) the capacity to choose realistic action goals, and 3) the utilization of these tools during daily life.

Furthermore, an examination of baseline participant attributes can help explain responses to rehabilitation and be used to develop more effective interventions. For this reason, the parent investigation measured several participant attributes besides HRQOL. Current studies are examining voice production and consonant articulation measures, apathy, and facial masking.^{42–44} Recently it was found that self-management rehabilitation more effectively increased walking endurance in our participants whose endurance was lower as opposed to higher at baseline.²⁹ In light of these findings, we conducted follow-up analyses to compare participants who scored below the median on the PDQ-39 at baseline with those who scored above the median (Figure 3). Rehabilitation more effectively improved mobility outcomes of participants who at baseline had more concerns about their mobility (higher mobility scores) compared to those who had less concerns in this area ($F(1,111) = 3.89, p = .05$). This same pattern emerged in activities of daily living ($F(1,111) = 12.59, p = .001$), the only targeted domain that had not demonstrated a main effect of rehabilitation intensity. There were similar patterns, yet not significant, for communication ($F(1,111) = 0.13, p = .72$) and

the summary index ($F(1,111) = 2.11, p = .15$). Thus intervention appeared to be most beneficial for participants' self-identified concerns. Continued development of HRQOL measures and rehabilitation programs that are responsive to individuals' concerns are warranted.

The strengths of this study include that it is among the largest randomized-controlled trials of physical rehabilitation for community-living PD, provided a rigor that is difficult to achieve in behavioral studies, involved a six-month follow-up period, had high adherence, and had few drop outs, especially given the degree of commitment required for commuting and participation. It sets a standard for the development of future best practice studies designed to provide and test individualized, client-focused intervention.

People with PD typically are referred to rehabilitation when their physical functioning has severely declined or when there is an acute change in status. It is not standard practice for rehabilitation to occur at the earlier to middle stages of this chronic disease when there are gradual declines in HRQOL and daily function. A theory- and evidence-based self-management approach recognizes that individual patient needs, preferences, and action directed toward realistic goals are fundamental to successful rehabilitation outcomes in community-living adults. This study's findings suggest that self-management rehabilitation be considered in the early to middle stages of PD to improve and sustain HRQOL.

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Figure 1. Flow diagram of participants through each stage of the trial

Figure 2. Adjusted means (standard error) of PDQ-39 Summary Index post intervention and at follow-up

Lower points indicate better outcomes. Values are adjusted for baseline summary index ($M = 31.7$, $SE = 1.03$).

Figure 3. HQROL responses of participants with low baseline versus high baseline scores High baseline group had scores above the median (more problematic HQROL), while the low baseline group had scores below the median (less problematic HQROL). The bars show the raw means with error lines (SEM) comparing baseline to post intervention for each rehabilitation intensity condition.

Table 1**Content of group self-management rehabilitation sessions in the clinic**

Motion, flexibility, and strength exercises (25 min.)
<ul style="list-style-type: none"> • Active ranging/stretching to increase trunk extension/rotation • Stretching hip flexors, hamstrings and gastrocnemius, • Strengthening trunk/hip postural muscles, knee and ankle extensors
Speech exercises (10 min.)
<ul style="list-style-type: none"> • Active ranging/stretching facial muscles • Strengthening muscles of vocal folds • Vocal rate control and intensity
Daily function training examples (15 min.)
<ul style="list-style-type: none"> • Moving in bed • Rising from chair • Up and down from floor • Social communication • Dressing • Handwriting • Swallowing • Social Communication
Gait training (10 min.)
<ul style="list-style-type: none"> • Walking with external auditory cues to optimize gait pattern and speed
Group discussion (30 min.)
<ul style="list-style-type: none"> • Barriers to exercise, communication, mobility • Benefits of exercise • Enhancing social communication • Strategies to improve walking • Mastering moving in bed, rising from chairs • Coping with tremor, stiffness • Self-management for life: moving forward • Preventing falls • Talking on the phone • Strategies to improve dressing • Relaxation, stress management • Self-management for life: staying on track

Table 2

Baseline participant characteristics by rehabilitation condition

Patient Characteristic	Rehabilitation Intensity*			Total Sample
	0 hrs	18 hrs	27 hrs	
	Percentage			
Female	32.5	29.7	28.2	30.2
Race (white)	95.0	100.0	94.9	96.6
Education				
High school	10.0	13.5	20.5	14.7
Post-secondary/college	37.5	27.0	28.2	31.0
Graduate/post-graduate	52.5	59.5	51.3	54.3
Has spouse/partner	75.0	86.5	82.1	81.0
Living with family/friend	74.4	86.1	89.5	83.2
PD medications in use				
Levodopa	80.0	75.7	84.6	80.2
DA agonist	62.5	73.0	76.9	70.7
COMT inhibitor	17.5	29.7	25.6	24.1
Selegiline	15.0	21.6	20.5	19.0
Amantadine	17.5	21.6	15.4	18.1
Anticholinergic	5.0	5.4	7.7	6.0
Hoehn & Yahr (on)				
2.0	47.5	43.2	51.3	47.4
2.5	30.0	43.2	35.9	36.2
3.0	22.5	13.5	12.8	16.4
Initial symptoms				
Right side	37.8	60.0	47.2	48.1
Left side	54.1	37.1	47.2	46.3
Both sides	8.1	2.9	5.6	5.6
Tremor	56.4	56.8	56.4	56.5
Postural Instability	2.6	0.0	5.1	2.6
Bradykinesia	51.3	56.8	61.5	56.5
Rigidity	61.5	51.4	48.7	53.9
	Mean (SD)			
Age	65.6 (8.3)	65.8 (8.3)	67.6 (10.3)	66.3 (9.0)
Mini-Mental Status Exam	29.3 (0.9)	29.1 (1.0)	29.4 (1.0)	29.3 (1.0)
Geriatric Depression Scale	6.0 (3.8)	6.6 (4.9)	6.5 (3.8)	6.3 (4.2)
Number of comorbidities	5.1 (2.2)	5.2 (1.8)	5.3 (2.0)	5.2 (2.0)
Years since diagnosis	7.0 (5.8)	7.0 (5.3)	7.2 (6.0)	7.1 (5.7)
PDQ-39 Summary index	29.7 (11.5)	33.1 (10.6)	32.3 (11.1)	31.7 (11.1)
Mobility	35.4 (20.7)	34.5 (15.5)	34.6 (19.4)	34.8 (18.6)
Activities of daily living	35.4 (20.3)	43.2 (22.3)	36.3 (19.1)	38.2 (20.7)
Emotional well-being	26.1 (14.8)	34.8 (19.0)	30.4 (13.2)	30.4 (16.1)

Patient Characteristic	Rehabilitation Intensity*			Total Sample
	0 hrs	18 hrs	27 hrs	
Stigma	18.4 (17.3)	25.8 (18.9)	21.2 (18.9)	21.7 (18.5)
Social supports*	13.5 (14.8)	23.2 (19.9)	20.9 (18.4)	19.1 (18.1)
Cognitions	36.3 (20.2)	33.6 (20.9)	37.5 (16.9)	35.8 (19.3)
Communication	30.4 (20.3)	30.4 (19.3)	29.7 (20.5)	30.2 (19.9)
Bodily discomfort	42.1 (21.3)	39.0 (20.9)	47.9 (21.9)	43.0 (21.5)

For 0 hrs condition, n = 40; for 18 hrs condition, n = 37; for 27 hrs condition, n = 39. There are missing responses for the following variables, with numbers of missing responses given in parentheses (representing left- to right-hand columns in the table): living with family/friend (1,1,1,3); years since diagnosis (0,0,1,1); side of initial symptoms (3,2,3,8); initial tremor, postural instability, bradykinesia and rigidity (1,0,1,1).

* There were no significant differences between conditions for any patient characteristic except for PDQ-39 social support ($p < .05$).

Table 3

Adjusted mean (standard error) for PDQ-39 scores controlling for baseline in the intention to treat analysis

PDQ-39 Domain	Assessment Period	Rehabilitation Intensity			Intensity Effect	
		0 hrs	18 hrs	27 hrs	<i>eta</i> (95% CI)	p
Summary index	Post ^{*†}	31.0 (1.1)	27.6 (1.1)	27.3 (1.1)	.23 (.05 to .40)	.01
	2 month follow-up	30.6 (0.9)	28.5 (1.0)	28.4 (1.0)	.16 (−.02 to .34)	.09
	6 month follow-up [†]	31.5 (1.1)	29.2 (1.1)	28.2 (1.1)	.21 (.03 to .38)	.02
Mobility	Post	33.3 (1.9)	30.2 (1.9)	28.8 (1.9)	.16 (−.02 to .34)	.08
	2 month follow-up	34.0 (1.9)	32.1 (2.0)	30.1 (1.9)	.13 (−.05 to .31)	.16
	6 month follow-up [†]	36.0 (1.9)	34.5 (2.0)	29.7 (1.9)	.20 (.02 to .37)	.03
Activities of daily living	Post	35.4 (1.9)	32.8 (2.0)	31.3 (2.0)	.14 (−.04 to .32)	.14
	2 month follow-up	33.6 (2.2)	31.3 (2.3)	35.6 (2.2)	−.04 (−.22 to .14)	.70
	6 month follow-up	35.0 (2.3)	32.3 (2.4)	32.7 (2.3)	.07 (−.11 to .25)	.43
Emotional well being	Post	28.4 (1.8)	25.2 (1.9)	26.6 (1.8)	.08 (−.10 to .25)	.40
	2 month follow-up	28.8 (1.9)	26.8 (2.0)	26.2 (1.9)	.09 (−.09 to .27)	.33
	6 month follow-up	30.2 (2.0)	26.1 (2.1)	25.9 (2.0)	.15 (−.03 to .33)	.11
Stigma	Post	21.1 (2.0)	17.6 (2.0)	19.0 (2.0)	.09 (−.10 to .25)	.36
	2 month follow-up	19.1 (1.9)	18.4 (2.0)	20.9 (1.9)	−.05 (−.23 to .14)	.61
	6 month follow-up	21.0 (1.8)	17.0 (1.8)	18.4 (1.8)	.12 (−.07 to .29)	.21
Social support	Post	17.1 (1.9)	16.7 (2.0)	16.1 (1.9)	.03 (−.15 to .22)	.72
	2 month follow-up	17.1 (1.8)	15.6 (1.8)	17.7 (1.8)	−.01 (−.19 to .18)	.94
	6 month follow-up	15.6 (1.7)	17.2 (1.7)	19.3 (1.7)	−.14 (−.32 to .04)	.13

PDQ-39 Domain	Assessment Period	Rehabilitation Intensity			Intensity Effect	
		0 hrs	18 hrs	27 hrs	<i>eta</i> (95% CI)	p
Cognitions	Post	37.3 (1.6)	33.1 (1.7)	35.4 (1.6)	.10 (−.08 to .28)	.27
	2 month follow-up	35.8 (1.7)	34.8 (1.8)	34.3 (1.8)	.06 (−.13 to .24)	.55
	6 month follow-up	36.2 (1.9)	36.1 (2.0)	34.1 (1.9)	.07 (−.12 to .25)	.49
Communication	Post [†]	32.3 (2.2)	28.4 (2.3)	25.7 (2.2)	.19 (.01 to .36)	.04
	2 month follow-up [†]	33.4 (2.0)	28.9 (2.0)	27.5 (2.0)	.20 (.02 to .37)	.03
	6 month follow-up	31.7 (2.2)	32.7 (2.3)	28.8 (2.2)	.07 (−.11 to .25)	.46
Bodily discomfort	Post	40.8 (2.4)	37.6 (2.5)	37.0 (2.5)	.11 (−.08 to .28)	.25
	2 month follow-up	39.6 (2.7)	41.8 (2.8)	36.3 (2.7)	.06 (−.13 to .24)	.54
	6 month follow-up	42.9 (2.7)	39.7 (2.8)	38.2 (2.7)	.12 (−.07 to .29)	.21

For 0 hrs condition, n = 40; for 18 hrs condition, n = 37; for 27 hrs condition, n = 39. Values are adjusted for PDQ-39 baseline scores found in Table 2. The *eta* reported in this table depicts the magnitude of the linear relationship between hours of rehabilitation (0, 18, 27) and PDQ-39 outcomes, and is interpreted as a product moment correlation (*r*) effect size.

There are no significant differences between pairwise comparisons of 18 hrs and 27 hrs.

* $p < .05$ between 0 hrs and 18 hrs.

[†] $p < .05$ between 0 hrs and 27 hrs.