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Which measures of physical function and motor impairment best predict quality of life in Parkinson's disease?

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Which Measures of Physical Function and Motor Impairment Best Predict Health Related Quality of Life in People with Parkinson's Disease?

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Abstract: The emphasis of treatment for patients with Parkinson disease (PD) is increasingly concerned with the impact on health related quality of life (HRQOL). Our objective was to compare the relative value of elements of the motor system in predicting the physical mobility domain of HRQOL in order to specify targets for intervention. The Parkinson's Disease Questionnaire-39 (PDQ-39) was used to assess HRQOL in 263 subjects with PD (H&Y 2.35 $\pm$ 0.7). A battery of tests assessing demographics, motor impairments and physical function were administered including the MDS-UPDRS, 10-meter walk test, 6-minute walk test, Freezing of Gait Questionnaire, Timed Up & Go, Functional Gait Assessment, Berg Balance Test, Functional Reach and 9- Hole Peg Test. The results of the hierarchical regression analysis revealed that demographic factors accounted for 33% of the variance in $PDQ\text{-}39_{mobility}$ score. When motor impairments were added to the model, the bradykinesia composite score contributed a small but significant portion of the variance (R^2 change = 0.04, $p<0.001$). The tremor and rigidity composite scores did not contribute significantly. The Freezing of Gait Questionnaire was the strongest predictor (R^2 change = 0.20, $p<0.001$) of the physical function tests followed by Functional Gait Assessment (R^2 change = 0.06, $p<0.001$) and 6-minute walk test (R^2 change = 0.01, $p=0.01$) accounting for 61% of the variance in $PDQ\text{-}39_{mobility}$ score and 44.5% of the more global $PDQ\text{-}39_{total}$ score. These results suggest greater value of physical function tests, and not tests of motor impairments, in predicting HRQOL. Targeting mobility limitations is an important consideration.

Key words: Quality of life, Parkinson disease, motor, mobility

Introduction:

Measures of health related quality of life (HRQOL) and related concepts are increasingly used as outcome indicators in both research and in clinical practice for patients with neurological disorders.[1] For individuals with Parkinson's disease (PD), the emphasis of treatment has shifted from one concerned primarily with ameliorating impairments of the motor system to one that also considers the impact of the disease state on HRQOL. To date; however, clinical measures that strongly predict HRQOL in PD remain unclear. Identifying predictors of HRQOL is necessary in order to target intervention most effectively.

Impairments of the motor system have long been the primary target of pharmacological interventions. However, an analysis from the DATATOP trial revealed that the Unified Parkinson Disease Rating Scale (UPDRS) items reflecting severity of impairments of the motor system (e.g., bradykinesia, rigidity, tremor) were not significant predictors of decline in quality of life.[2] In contrast, several studies have identified an association between higher (worse) UPDRS postural instability gait disorder (PIGD) scores and poorer HRQOL.[2-4] This suggests a stronger relationship may exist between HRQOL and functional mobility (i.e., gait and postural control) than between HRQOL and motor impairments.

Given that the mobility items related to postural instability and gait limitations appear to be most related to HRQOL – other measures of mobility and physical function may provide additional predictive value and should be considered. Despite their common use and well-accepted clinical value, UPDRS items are limited in scope. PIGD items, for example, generally focus on the presence or absence of gait impairment, freezing, postural control using an external perturbation, use of a walking aid or physical assistance of another person. These items do not consider other important functional considerations such as walking speed, endurance, obstacle negotiation or performance during other more complex walking and balance tasks.

Clinical physical function measures, in contrast, provide a relatively more comprehensive assessment of gait and balance limitations. Many valid and reliable tests of physical performance are available and include tests of walking (e.g., 10 meter walk test, 6 minute walk test, Freezing of Gait Questionnaire), postural control (e.g., Berg Balance Test, Functional Gait Assessment, Functional Reach), transitional movements (e.g., Timed Up & Go) and upper extremity function (e.g., 9 hole peg test). Although these tests are commonly used by PD-focused researchers and clinicians, the extent to which they may provide value – either independently or in addition to the PIGD score - in predicting HRQOL has not been investigated.

The purpose of this study was to identify factors that strongly predict HRQOL in PD. Our specific objective was to expand on previous work by directly comparing three groups of relevant factors. The groups were: demographic factors, motor system impairments measured by the gold standard UPDRS, and physical function factors. In particular, we sought to compare the ability of each factor to predict the perception of HRQOL as reflected in the mobility domain of the PDQ-39 (PDQ-$39_{mobility}$). The PDQ-$39_{mobility}$ was targeted in this study to hone in on the relationship between motor impairments, physical function limitations and perceived health related to the physical domain of HRQOL. Based on previous research,[2-4] we hypothesized that measures of mobility - and not measures of motor impairment - would predict significance portions of the variance in the PDQ-$39_{mobility}$ score. In addition, we hypothesized that other measures of gait and balance - beyond the PIGD score – would significantly predict PDQ-$39_{mobility}$ score.

PATIENTS AND METHODS:

Study Population:

A cross-sectional analysis was conducted on two-hundred and twenty individuals with PD who were participating in a larger longitudinal study. Subjects were recruited from Movement Disorders clinics and local support groups at Boston University, University of Utah, Washington University and University of Alabama. Inclusion criteria included: a diagnosis of idiopathic PD according to the UK Brain Bank Criteria, modified Hoehn and Yahr stages I-IV, age $\geq$ 40 years, living in the community (not institutionalized), able to attend assessment sessions and provide consent. Subjects were excluded if they had a diagnosis of atypical Parkinsonism, H&Y stage 5 or had previous surgical management of their PD. This study was approved by the Intuitional Review Boards of all 4 institutions. All subjects who participated in the study provided informed consent following initial screening.

Study Design:

Subjects participated in an examination in an outpatient clinic over a 2.5 hour period. Timing of testing was standardized in that all subjects were tested on medication. The following measures were administered as part of a larger battery of tests: (1) Parkinson's Disease Questionaire -39 (PDQ-39), (2) Unified Parkinson Disease Rating Scale (MDS-UPDRS) (3) Freezing of Gait Questionnaire (FOG-Q-Q); (4) Nine Hole Peg Test (9HPT), (5) Berg Balance Test (BBT), (6) Functional Reach (FR), (7) Functional Gait Assessment (FGA), (8) Timed Up & Go (TUG), (9) Ten Meter Walk Test (10MWT), (10) Six Minute Walk Test (6MWT). Measures were selected based on their common use in PD clinical settings and strong psychometric properties. Evaluators across sites were trained in the standardized implementation of each test using instructional videos.

Measures:

Parkinson's Disease Questionnaire-39 (PDQ-39):

The PDQ-39 has been described as a HRQOL instrument that measures health status or perceived health in terms of physical, mental and social functions.[1, 5] The scale has 39 items made up of 8 subscales: mobility (10 items), activities of daily living (6 items), emotional well-being (6 items), stigma (4 items), social support (3 items), cognition (4 items), communication (3 items) and bodily discomfort (3 items). Each item contains a 5-point Likert scale with response categories ranging from never to always. Scores range from 0-100 with higher scores reflecting a lower health related quality of life. The mobility domain ($PDQ\text{-}39_{mobility}$) contains items concerning the frequency in which patients have difficulty getting around the household and community and participate in chores and leisure activities.

The PDQ-39 was self-administered by each subject. In the event a subject required assistance to complete the questionnaire, the item was read to the participant and the response was recorded. An index score was calculated for $PDQ\text{-}39_{mobility}$ and for the total scale $PDQ\text{-}39_{total.}$[6] Adequate internal consistency, test–retest reliability, and responsivity have been demonstrated in both the total and motor subscale score.[7, 8] Given the emphasis in this study on predicting HRQOL related to the physical domain, the mobility subscale score of the PDQ-39 served as the primary dependent variable. Once significant predictors of the mobility subscale were identified, their value in predicting the PDQ-39 total score was investigated.

Demographic Factors:

Demographic and disease specific factors typically gathered in a clinical setting of patients with PD were collected. These included age, gender, disease duration and disease severity. Disease severity was measured with the widely utilized modified Hoehn and Yahr Scale (H&Y).[9]

Motor Impairment Factors:

Unified Parkinson Disease Rating Scale (UPDRS):

The Movement Disorder Society (MDS) revised version of the UPDRS was used in this study. Validity and high internal consistency have been demonstrated.[10] Part II (motor experiences of daily living) was self-administered by all subjects and part III (motor examination) was administered by trained investigators. For the analysis, composite scores for the following areas were established: 1) bradykinesia (left and right finger taps, hand movements, pronation-supination, heel-taps, leg agility and body bradykinesia), 2) rigidity (left and right arms, left and right legs, neck) and 3) tremor (left and right resting, postural, kinetic).[11]

Physical Function Factors:

Postural Instability and Gait (PIGD) items of the UPDRS:

The PIGD items of the MDS UPDRS consisted of the walking / balance and freezing items of part II and the gait, freezing of gait and postural instability items of part III.[11]

The 10 meter walk test (10MWT):

The 10MWT is a test used to measure the time it takes for subjects to walk 10 meters at maximum speed. Validity, high test-retest reliability and responsiveness have been established in patients with a variety of neurological disorders including those with PD.[12, 13]

The Six Minute Walk Test: (6MWT):

The 6MWT is a test used to measure the distance subjects can walk in 6-minutes. Subjects were instructed to walk for six minutes covering as much ground as possible. Validity and high test-retest reliability have been demonstrated in patients with cardiopulmonary disease and in patients with neurological diseases including those with PD.[14-16]

The Freezing of Gait Questionnaire (FOG-Q):

The FOG-Q is a valid and reliable 6-item survey tool used to assess the severity of freezing of gait in patients with PD.[17] Each item is rated on a 5-point (0-4) ordinal scale with the total score (sum of 6 items) ranging from 0 (absence of symptom) to 24 (most severe symptom). The FOG-Q was self-administered by all subjects in this study.

Functional Gait Assessment (FGA):

The FGA is a 10-item standardized test for assessing postural stability during various walking tasks. Items include tasks such as walking with head turns, eyes closed, while altering gait speed and in a backward direction, negotiating obstacles, narrowing base of support, stopping, turning and stair climbing. Items are scored using a 4-point ordinal scale (0-3) and scores range from 0 to 30 with lower scores indicating more impaired performance. Reliability, internal consistency and validity have been established.[18, 19]

Berg Balance Test (BBS):

The BBS is a 14-item scale that quantitatively assesses balance and risk for falls through direct observation of performance.[20] This scale requires approximately 15 minutes to complete and measures the subject's ability to maintain balance either statically or dynamically over a specified period of time.[21] The items are scored on a 5 point (0-4) ordinal scale. The total score

ranges from 0 to 56 with higher scores indicating better balance. Validity and high test-retest reliability has been demonstrated.[15, 22]

Functional Reach Test (FR):
The FR is a test used to measure the maximum distance subjects can reach in the forward direction while their base of support remains fixed.[23] The mean of these 3 trials was used in the analysis. Validity and high test-retest reliability have been established.[15, 23]

Timed Up & Go (TUG):
The TUG is a test used to measure the time it takes for subjects to rise from a chair, walk 3 meters, turn, walk back and sit down again. Each subject performed 2 trials and the mean time was used in the analysis. Validity, high test-retest reliability and responsiveness have been established.[13, 24]

Nine Hole Peg Test (9HPT):
The 9HPT is a timed measure of fine dexterity and involves placing and removing nine pegs in a pegboard.[25] The mean time of 2 trails using the non-dominant hand was used in this analysis. Validity and reliability have been established and responsiveness to change demonstrated in patients with PD.[26, 27]

Statistical Analysis:
Means $\pm$ standard deviations (SD) were calculated for all dependent and independent variables. Pearson and Spearman correlation coefficients were conducted to examine the strength of association between the PDQ-$39_{mobility}$ and demographic variables, variables representing the motor impairments and the physical functions measures. Results were similar between Pearson and Spearman; therefore only Pearson correlation coefficients are presented. Those variables found to correlate significantly ($p<.05$) with the PDQ-$39_{mobility}$ were entered into a hierarchical regression model.

With the PDQ-$39_{mobility}$ score as the dependent variable, independent variables were entered systematically as three separate blocks into a hierarchical regression analysis. The order of block entry was determined according to the following clinical rationale: demographic variables (block 1) were entered first based on their non-modifiability; the motor impairment variables (block 2) were entered next based on their widespread traditional use and potential to respond to pharmacologic intervention; physical function variables (block 3), because of their potential to identify targets for rehabilitation intervention, were entered last to assess their predictive value above and beyond the preceding factors.

Within each block, variables were entered in stepwise fashion. Using an F test ($\alpha = 0.05$), the significance of the R^2 and R^2 change values was examined to identify the strongest predictors of the PDQ-$39_{mobility}$ score. Those variables found to predict significant portions of the PDQ-$39_{mobility}$ score were then entered into a regression model with the PDQ-39_{total} score as the dependent variable to further assess the predictive value of these mobility tests on overall quality of life. All data were analyzed using the statistical software program SPSS 16.0.

Results:
Two-hundred and sixty-three subjects with PD participated in this study. Characteristics of the sample are presented in Table 1. The mean age was 67.7 (9.2), H&Y 2.35 (.69), disease duration 6.2 (4.8) and 57% were male. The mean PDQ-$39_{mobility}$ score was 24.2 (22.8) and the mean

PDQ-39_{total} score was 21.3 (13.4). Significant correlations were found between the PDQ-$39_{mobility}$ score and all independent variables with the exception of sex (Tables 2 & 3). Older age, longer disease duration and worse disease severity were significantly correlated with poorer PDQ-$39_{mobility}$ scores with magnitudes ranging from .24 to .51. Poorer scores on the tremor, rigidity and bradykinesia composite scores were significantly correlated to poorer PDQ-$39_{mobility}$ scores with magnitudes ranging from .19 to .49. A poorer performance on the PIGD, FOG-Q, 9HPT, FR, BBS, FGA, TUG, 10MWT and 6MWT was significantly correlated to poorer PDQ-$39_{mobility}$ scores with magnitudes ranging from .30 to .72.

The results of the hierarchical regression analysis to predict PDQ-$39_{mobility}$ scores are presented in Table 4. Demographic factors (block 1) accounted for 33% of the variance in PDQ-$39_{mobility}$ score. The modified H&Y was the strongest predictor of the demographic variables (R^2 =0.26, $p<0.001$) followed by disease duration (R^2 change = 0.06, $p<0.001$) (Table 4, Model 1). When the motor impairment factors (block 2) were added to the model, the bradykinesia composite score contributed a small but significant portion of the variance in PDQ-$39_{mobility}$ score (R^2 change = 0.04, $p<0.001$). The tremor and rigidity composite scores did not contribute significantly to the model. (Table 4, Model 2). Three of the nine physical function test scores (block 3) significantly contributed to the model (Table 4, Model 3) with the FOG-Q score as the strongest predictor (R^2 change = 0.20, $p<0.001$) followed by the FGA score (R^2 change = 0.06, $p<0.001$) and the 6MWT distance (R^2 change = 0.01, $p=0.01$). Collectively, those variables from each block that contributed significantly to the model accounted for 61% of the variance in PDQ-$39_{mobility}$ score and 44.5% of the more global PDQ-39_{total} score.

Discussion:

Our objective was to expand upon previous research by comparing the relative predictive value of various factors, both newly and previously identified, for predicting HRQOL in PD. Specifically, we sought to identify potential targets for an optimal intervention strategy geared toward improving quality of life.

Our analysis was based on an *a priori* clinical rationale that recognized both the unmodifiability of certain demographic factors (e.g., age and duration of disease), the longstanding clinical focus on motor impairments (e.g., bradykinesia or tremor) as targets of pharmacological intervention and the potential importance of physical function factors in predicting HRQOL. Accordingly, the analysis revealed that demographic factors uniquely predicted the greatest portion of variance (33%) in mobility-related quality of life; UPDRS indicators of motor impairments uniquely predicted less than 1%, and physical function measures of mobility and postural control uniquely predicted a final 24%. After taking demographic factors into account, measures of physical mobility appeared to be stronger predictors of mobility-related quality of life than did the motor impairment indicators, supporting our initial hypothesis.

The results of this study are consistent with the results of previous studies.[2-4] Motor impairments, such as tremor and rigidity, did not predict the PDQ-39 mobility score which suggests a weak relationship between the motor impairments associated with PD and quality of life related to mobility. Some studies also found that bradykinesia was not a significant predictor of quality of life.[28] However, bradykinesia did account for a significant but very small portion of the variability in HRQOL related to physical mobility, consistent with the results of Muslimovic and colleagues.[3] The result lends further support to the idea that pharmacological interventions targeting motor impairments, especially when used in isolation, may be unlikely to have a significant impact on mobility-related quality of life.

Our findings suggest the relative importance of physical mobility limitations on HRQOL. The value of additional clinical measures of mobility, particularly the FOG-Q and the FGA, are evident. This suggests that the severity and nature of freezing episodes in addition to postural control in the context of more advanced gait activities are more strongly related to HRQOL compared to tremor and rigidity. In this study, the PIGD composite score did not significantly contribute to the variance in mobility related quality of life. However, the PIGD score was highly correlated with the FOG-Q score. A secondary analysis removing the FOG-Q variable from the analysis revealed that the PIGD score contributed significantly to the model (17% compared to 20% from the FOG-Q) with the FGA continuing as the second largest contributor. This provides additional evidence suggesting the greater value of measures of gait and balance in predicting HRQOL.

These physical function measures are generally easily administered in a clinical environment. The advantage of the FOG-Q is that it contains only 6-items, is self-administered and takes less than 5 minutes to complete. On the other hand, it may not adequately capture mobility limitations in those patients who do not experience gait freezing episodes. The FGA provides a broader assessment of gait and balance limitations which may help the clinician / researcher to hone in even further regarding the specific nature of the gait/balance limitation. Difficulties with walking speed, turning, changing directions, negotiating obstacles and assuming a narrow base of support can be observed and potentially targeted more specifically in treatment. However, the FGA requires more space to administer (20 feet and access to stairs) and takes about 10 minutes to complete. The advantage of using the PIGD composite score is that multiple aspects of mobility are captured (i.e., gait, postural control and freezing related to gait) providing a sampling across several potentially important mobility limitations. In addition, information from both self-report and performance based items are included which may substantiate the findings as input from both the patient and examiner are considered. The disadvantage of using items within the UPDRS is the training necessary to administer the motor section. In addition, the items within the PIGD are scored using a narrow ordinal providing little information as to the nature of the freezing or postural control deficits.

The relative greater value of measures of gait and balance compared to measures of motor impairments such as rigidity and tremor in predicting quality of life suggests that treatment targeted toward these aspects of mobility should be considered. Shulman and colleagues recently highlighted the pivotal role of gait and balance in daily function and suggested that difficulty with ambulation should be considered a clinical “red flag” that indicates emerging disability.[29] Although pharmacological treatment is generally effective in ameliorating the motor symptoms associated with PD, it is less effective in treating gait and postural control deficits. In contrast, there is evidence to support the effectiveness of physical therapy interventions in improving aspects of gait and postural control.[30, 31] treadmill training,[32] use of external cues,[33] strengthening exercises,[34] and balance training,[35, 36] have been demonstrated to improve gait, balance, freezing and quality of life[37] in patients with PD and should be considered for those with mild to moderate disease severity. Addressing emerging gait and postural control deficits may help to delay disability and optimize quality of life.

The strengths of this study include the relatively large sample size, participation of subjects across four different sites and training to ensure a standardized approach to administering outcome measures across these sites. These factors enhance the generalizability of our findings. This study is one of the few to investigate the relationship between several widely used measures

of gait and balance and HRQOL. The results underscore those with the greatest predictive value helping to guide selection of outcome measures by clinicians and researchers. When considering the significant contributors within all three variable groups (i.e., demographics, motor impairment and physical function measures), the hierarchical model accounted for 61% of the variance in $PDQ\text{-}39_{mobility}$ score. Although no previous studies exist with which to compare, we believe that the combination of factors included in the study may represent the majority of significant mobility related HRQOL predictors in PD.

Limitations of the study include the cross-sectional nature of the analysis. Therefore, inferences about factors that predict changes in quality of life over time can not be made. Although collectively the variables entered into the regression model accounted for 61% of the variability in the PDQ-39 mobility subscore, 39% remains unaccounted for suggesting the importance of identifying other relevant factors. Depression, anxiety, insomnia and mood have been shown to impact overall HRQOL.[38-40] It is conceivable that these factors could also impact the physical domain of HRQOL. Results from the DATATOP trial demonstrated an association between changes in PIGD score and changes in both mental and physical HRQOL.[2] Other possible limitations of this study include the potential overlap between measures of functional mobility and the items in the physical domain of the PDQ-39. For example, items # 4 and # 5 of the PDQ-39 physical mobility domain inquire about difficulties with walking ½ mile and 100 yards respectively. However, the strength of the correlations between the $PDQ\text{-}39_{mobility}$ score and items directly measuring walking (6MWT, 10MWT, TUG) were similar to the strength of the correlations between the upper extremity function item (9HPT) and balance tests (BBS, FGA). In addition, only one walking measure (6MWT) was retained in the final model and it contributed less than 1% to the variability in the $PDQ\text{-}39_{mobility}$ score. It appears that the more complex mobility tests measuring more than one construct – fluid walking without hesitation while maintaining postural control – more strongly impact the real-life mobility experiences of patients in the home and in the community.

In summary, performance on physical function tests of gait and postural control predicted significant portions of the variance in both the $PDQ\text{-}39_{mobility}$ score and the $PDQ\text{-}39_{total}$ score, suggesting the value of physical function tests in predicting HRQOL. Tests of motor impairments associated with PD were not significant predictors of HRQOL. This suggests that the severity of the motor impairments is less important to HRQOL than the functional limitations that result. The combination of the FOG-Q and the FGA were the strongest predictors of the $PDQ\text{-}39_{mobility}$ score when compared to other tests of functional mobility. Targeting mobility limitations in the treatment of patients with PD is an important consideration in the management of people with PD.

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Table 1: Subject Characteristics

Characteristic	Mean (SD) / Total # (%)	Range
Age (years)	67.7 (9.2)	40-88
Sex (males)	150 (57%)	
Disease duration (years)	6.22 (4.8)	<1-25
Hoehn & Yahr Stage	2.35 (.69)	1-4
Tremor composite score	4.5 (4.5)	0-30
Rigidity composite score	7.1 (4.0)	0-18
PIGD composite score	4.3 (3.6)	0-18
Bradykinesia composite score	15.3 (8.0)	1-40
Freezing of Gait Questionnaire	6.0 (5.4)	0-20
9 Hole Peg Test (sec)	32.2 (12.4)	17.8-99.6
Berg Balance Test	50.2 (6.8)	14-56
Functional Reach (cm)	28.0 (8.5)	6.0-52.3
Functional Gait Assessment	20.5 (6.4)	0-30
Timed Up & Go (sec)	13.2 (18.5)	5.1-219.0
10 meter walk test (maximum speed)	6.9 (3.5)	3.1-50.0
6 minute walk test (meters)	383.1 (157.0)	29-744
PDQ – 39 Motor Subscale Score	24.2 (22.8)	0-92.5
PDQ – 39 Total Score	21.3 (13.4)	.52-63.1

Table 2: Bivariate Correlation Coefficients for PDQ-39 Motor and Demographic Variables

	PDQ-39 Motor	Age	Gender	Disease duration	H&Y
PDQ Motor	------	.24**	.03	.40**	.51**
Age		------	-.08	.09	.24**
Gender			------	-.06	-.05
Disease duration				------	.29**
H&Y					------

** = significance at p <.01

Table 3: Bivariate Correlation Coefficients for PDQ-39 Motor and UPDRS and Mobility Variables

	PDQ-M	PDQ-T	Trem	Rig	PIGD	Brady	FOG	9HPT	FR	BBS	FGA	TUG	10MWT	6MWT
PDQ-M	----	.81**	.19**	.33**	.72**	.49**	.71**	.45**	-.40**	-.61**	-.66**	.30**	.42**	-.46**
PDQ-T		----	.16*	.30**	.53**	.46**	.57**	.37**	-.33**	-.44**	-.57**	.17*	.27**	-.35**
Tremor			----	.18**	.14*	.22**	.09	.11	-.14*	-.17**	-.12	-.02	-.01	-.07
Rigidity				----	.29**	.43**	.28**	.29**	-.32**	-.28**	-.26**	.07	.06	-.14*
PIGD					----	.53**	.79**	.51**	-.44**	-.68**	-.68**	.50**	.50**	-.44**
Brady						----	.40**	.49**	-.38**	-.50**	-55**	.30**	.32**	-.16*
FOG							----	.41**	-.36**	-.53**	-.54**	.32**	.31**	-.39**
9HPT								----	-.40**	-.52**	-.52**	.28**	.24**	-.33**
FR									----	.51**	.52**	-.19**	-.30**	.22**
BBS										----	.77**	-.37**	-.54**	.47**
FGA											----	-.39**	-.58**	.50**
TUG												----	.66**	-.27**
10MWT													----	-.43**
6MWT														----

** = significance at p <.01; * = significance at p <.05

Table 4: Hierarchical Stepwise Regression Analysis

	Model 1		**Model 2**		**Model 3**			
	Unstandardized Coefficients		Unstandardized Coefficients		Unstandardized Coefficients		Standardized Coefficients	
	B	*P*-value	B	*P*-value	B	Std Error	Beta	*P*-value
Block 1 (R^2 =.33)								
H&Y	14.6	<.001	10.1	<.001	.98	1.8	.03	.58
Disease Duration	1.3	<.001	1.1	<.001	.33	.21	1.6	.12
Age	---	---	---	---	-.13	.11	-1.1	.26
Block 2 (R^2 change =.04)								
Bradykinesia	---	---	.73	<.001	.32	.15	.11	.04
Block 3 (R^2 change =.24)								
FOG	---	---	---	---	1.8	.22	.41	<.001
FGA	---	---	---	---	-1.0	.22	-.29	<.001
6MWT	---	---	---	---	-.02	.01	-.13	.01
R^2	**.33**		**.37**		**.61**			

H&Y = Hoehn and Yahr Scale; FOG-Q = Freezing of Gait Questionnaire; FGA = Functional Gait Assessment; 6MWT = 6 minute walk test