



Measuring perceived and performance-based executive dysfunction in Parkinson's disease

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BACKGROUND

- Parkinson's disease (PD) impacts executive function, or the ability to regulate goal-directed activities.
- Laboratory based measures of executive function have limited ecological validity.
- The BRIEF-A is a self- and informant-report questionnaire designed to evaluate executive functions during completion of everyday tasks.
- To date, little is known about the ability of individuals with PD to reliably report upon their own cognition.
- Hypotheses:**
 - Individuals with PD would exhibit increased executive dysfunction on performance-based self-reported measures relative to healthy controls, and
 - Performance on neuropsychological tests would be associated with self- and informant-reported executive abilities.

METHODS

- 51 individuals with Parkinson's disease (Table 1) were compared to 38 healthy controls of similar age, sex, years of education, IQ (NAART-R), and global cognitive status (MMSE; Table 2).

Table 1. PD Demographics

N	DA (mg)	DISEASE DURATION	AGE OF DIAGNOSIS	UPDRS PART III	H & Y
	M(SD)	M(SD)	M(SD)	M(SD)	M(SD)
51	589.1(402.2)	5.4(4.2)	61.8(6.3)	22.2(14.8)	2.2(0.6)

- Each participant completed the following:

Performance-based measures of executive functions:

- D-KEFS Verbal Fluency Test
- D-KEFS Color-Word Interference Test

Self- and informant-report measures of executive functions

- BRIEF-A (Self-Report & *Informant Report Forms)**
 - ✓ **BRIEF-A, Metacognition Index:** an index capturing the ability to coordinate and sustain fluid problem solving for effective task completion
 - ✓ **BRIEF-A, Behavioral Regulation Index:** an index reflecting the ability to manage one's emotional and behavioral responses during daily life

* A spouse, close family member, or friend completed the BRIEF-A Informant Report Form on behalf of each participant.

Control variables

- Geriatric Depression Scale (depression)
- Symbol Digit Modalities Test (processing speed)
- WAIS-III Digit Span (attention and working memory)

RESULTS

Statistical Analyses

- Between group (PD vs. Control) and rater (self vs. informant) differences were evaluated using ANOVA with an alpha threshold of $p = 0.05$.
- Stepwise linear regression was used for each group to examine the relationship between the BRIEF-A (BRI and MI composite indices) and neuropsychological measures with the following independent variables: VF Category Fluency, VF Category Switching Accuracy, CWI Inhibition/Switching, GDS, SDMT, Digit Span, and UPDRS Part III (PD group only).

Table 2. Demographic and Descriptive Data

	N	AGE (years)	GENDER	EDUCATION (years)	GDS**	NAART FSIQ	MMSE
		M(SD)		M(SD)	M(SD)	M(SD)	M(SD)
PD	51	66.6(5.6)	25M	16.0(2.8)	6.4(5.0)	114.6(7.7)	28.6(1.7)
CONTROL	38	65.8(6.3)	19M	16.9(3.0)	2.3(2.8)	114.3(6.2)	28.6(1.3)

Note. *Significant difference between groups ($p < 0.05$). **Significant difference between groups ($p < 0.01$). +Significant difference between self- and other-report ($p < 0.05$).

- Significant difference between the groups were found for depression and processing speed, with the PD group endorsing more symptoms of depression and exhibiting slowed processing speed (Tables 1 & 2).

- No group differences were found on neuropsychological tests of executive functions (Table 3).

Table 3. Neuropsychological Tests

	SDMT*	DIGIT SPAN	VF Category Fluency	VF Category Switching	CWI Inhibition / Switching
	M(SD)	M(SD)	M(SD)	M(SD)	M(SD)
PD	43.9(11.6)	17.2(3.7)	40.0(8.1)	11.1(3.1)	76.7(30.7)
CONTROL	52.6(8.7)	17.1(4.0)	40.5(8.4)	11.1(3.5)	64.0(13.3)

Note. *Significant difference between groups ($p < 0.05$). **Significant difference between groups ($p < 0.01$). +Significant difference between self- and other-report ($p < 0.05$).

- On the BRIEF-A, individual's with PD endorsed more severe executive dysfunction on the Metacognitive Index than controls. PD participants also endorsed more severe impairment on this index than was reported by their informants. No additional group or rater differences were found for this measure (Table 4).

Table 4. BRIEF-A Self- and Informant Report

	BRIEF-A SELF BRI	BRIEF-A Self MI *+	BRIEF-A Informant BRI	BRIEF-A Informant MI +
	M(SD)	M(SD)	M(SD)	M(SD)
PD	50.0(10.8)	56.0(11.8)	47.9(8.0)	51.1(10.4)
CONTROL	48.6(11.3)	50.8(11.9)	48.6(7.9)	50.2(7.6)

Note. *Significant difference between groups ($p < 0.05$). **Significant difference between groups ($p < 0.01$). +Significant difference between self- and other-report ($p < 0.05$).

- Further analyses of the Metacognition Index (MI) revealed that the PD group self-reported significantly increased difficulties on the Initiate scale (i.e., problems generating ideas or starting tasks) than controls (Table 5).

Table 5. BRIEF-A MI Subscale

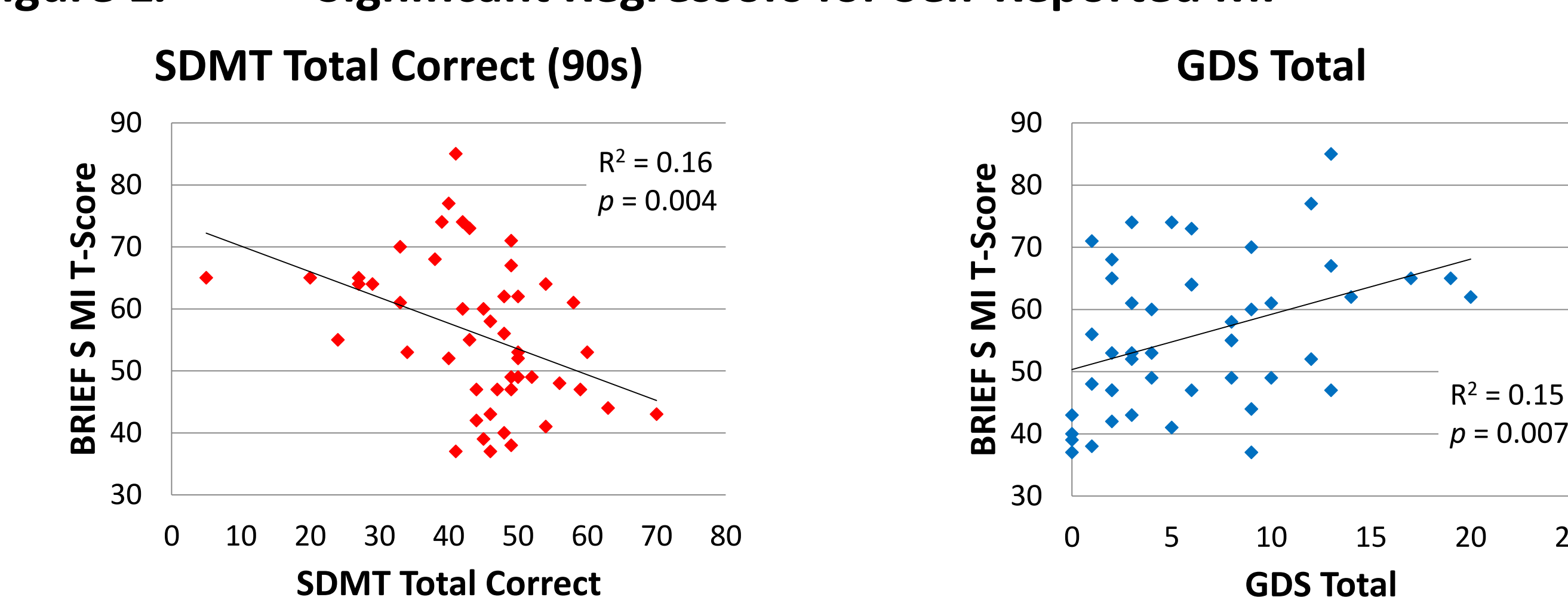
	INITIATE	WORKING MEMORY	PLAN / ORGANIZE	TASK MONITOR	ORGANIZATION OF MATERIALS
	M(SD)	M(SD)	M(SD)	M(SD)	M(SD)
PD SELF-REPORT	*53.6(14.8)	55.1(13.9)	53.8(14.5)	53.5(14.3)	51.1(14.6)
PD INFORMANT-REPORT	50.6(12.6)	51.1(12.6)	48.6(13.2)	50.4(11.9)	49.6(11.8)
CONTROL SELF-REPORT	48.2(10.1)	53.4(13.8)	50.9(11.2)	52.2(10.8)	50.0(10.5)
CONTROL INFORMANT-REPORT	50.3(8.8)	49.8(7.8)	48.9(7.4)	50.1(7.1)	51.8(9.5)

Note. *Significant difference between PD and control groups ($p < 0.05$).

RESULTS (continued)

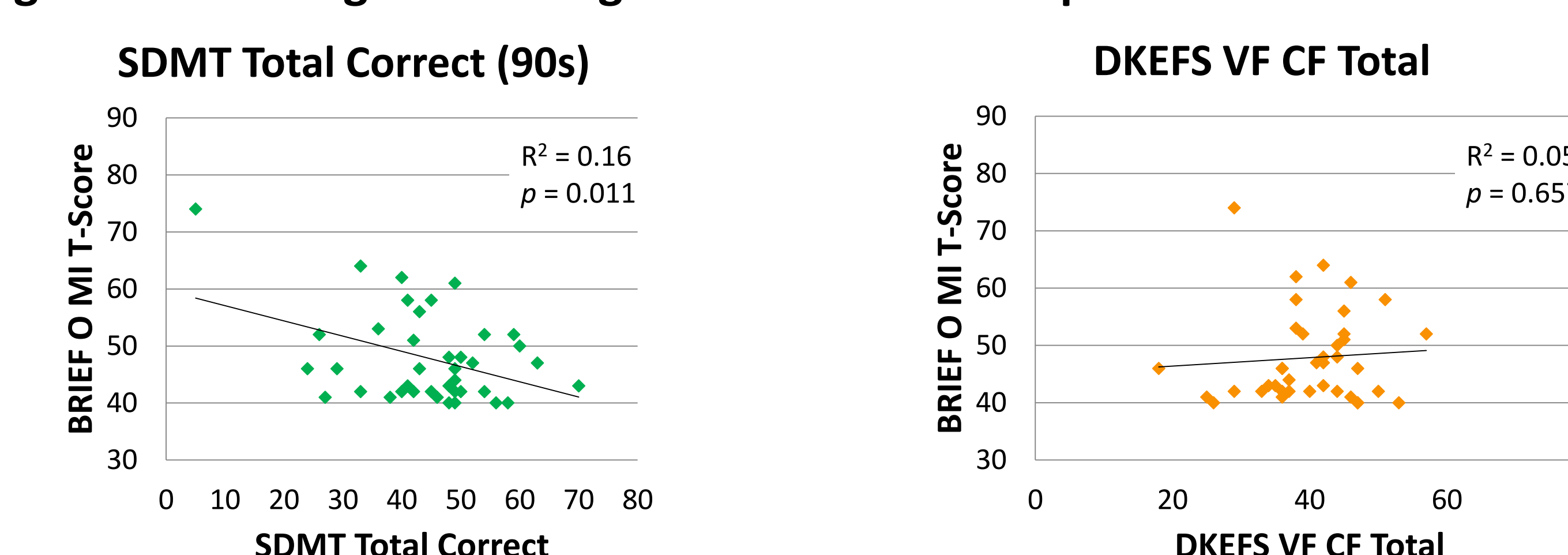
- For self-report MI T score in the PD group, the SDMT, $\beta = -.31$, $t(10) = -2.28$, $p = .027$, and the GDS were significant regressors, $\beta = .29$, $t(8) = 2.10$, $p = .042$; the model explained a significant proportion of the variance, $R^2 = .075$, $F(1,45) = 4.40$, $p = .042$ (Figure 1).

Figure 1. Significant Regressors for Self-Reported MI



- For other-report MI T score, decreased processing speed was associated with increased informant-reported executive dysfunction for the PD group: SDMT $\beta = -.75$, $t(9) = -4.6$, $p < .001$. VF Category Fluency was also a significant regressor, $\beta = -.45$, $t(7) = 2.77$, $p = .009$ which explained a significant proportion of variance, $R^2 = .13$, $F(1,37) = 7.64$, $p = .009$ (Figure 2).

Figure 2. Significant Regressors for Other-Reported MI



CONCLUSIONS

- Individuals with PD perceive executive dysfunction during completion of daily tasks that is not captured by performance-based neuropsychological tests of executive function.
- Problems initiating, coordinating, and sustaining daily problem solving as reported by individuals with PD appear to be related to slowed processing speed, and to a lesser extent, depression.
- Informants' perception of executive dysfunction is related to slowed processing speed as well as difficulties with fluid generation of semantic information (Category Fluency).
- Findings highlight the contribution of speeded processing for performance of everyday executive tasks in PD.
- The discrepancy between performance-based and reported executive dysfunction may reflect subtle, internal changes in cognition that are not yet observed by loved ones or captured by neuropsychological testing.

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