Published in final edited form as:

Mov Disord. 2008 October 15; 23(13): 1867–1874. doi:10.1002/mds.22170.

Medical Decision-Making Capacity in Cognitively Impaired Parkinson's Disease Patients Without Dementia

Roy C. Martin, PhD^{1,2}, Ozioma C. Okonkwo, MA³, Joni Hill³, H. Randall Griffith, PhD^{1,2}, Kristen Triebel, PsyD^{1,2}, Alfred Bartolucci, PhD^{2,4}, Anthony P. Nicholas, MD, PhD^{1,2,5}, Ray L. Watts, MD¹, Natividad Stover, MD¹, Lindy E. Harrell, PhD, MD^{2,4,5}, David Clark, MD^{2,4,5}, and Daniel C. Marson, JD, PhD^{1,2}

¹ Department of Neurology, University of Alabama at Birmingham, Birmingham, AL

² Alzheimer's Disease Research Center, University of Alabama at Birmingham, Birmingham, AL

³ Department of Psychology, University of Alabama at Birmingham, Birmingham, AL

⁴ Department of Biostatistics, University of Alabama at Birmingham, Birmingham, AL

⁵ Veterans Administration Medical Center, Birmingham, AL

Abstract

Little is currently known about the higher order functional skills of patients with Parkinson disease and cognitive impairment. Medical decision-making capacity (MDC) was assessed in patients with Parkinson's disease (PD) with cognitive impairment and dementia. Participants were 16 patients with PD and cognitive impairment without dementia (PD-CIND), 16 patients with PD dementia (PDD), and 22 healthy older adults. All participants were administered the Capacity to Consent to Treatment Instrument (CCTI), a standardized capacity instrument assessing MDC under five different consent standards. Parametric and non-parametric statistical analyses were utilized to examine capacity performance on the consent standards. In addition, capacity outcomes (capable, marginally capable, or incapable outcomes) on the standards were identified for the two patient groups. Relative to controls, PD-CIND patients demonstrated significant impairment on the understanding treatment consent standard, clinically the most stringent CCTI standard. Relative to controls and PD-CIND patients, patients with PDD patients were impaired on the three clinical standards of *understanding*, *reasoning*, and *appreciation*. The findings suggest that impairment in decisional capacity is already present in cognitively impaired PD patients without dementia, and increases as these patients develop dementia. Clinicians and researchers should carefully assess decisional capacity in all PD patients with cognitive impairment.

Keywords

consent capacity; medical decision-making; cognitive impairment without dementia; functional change; Parkinson's disease

Parkinson's disease (PD) is a common and progressively disabling neurological disorder. PD patients experience functional declines in many spheres of everyday life, including medication adherence, financial abilities, and driving¹⁻³. Interestingly, for many decades

Corresponding Author: Daniel Marson, J.D., Ph.D., Department of Neurology, Sparks Center 650, 1720 7th Avenue South, University of Alabama at Birmingham, Birmingham, AL 35294-0017. Tel: (205) 934-2334, fax (205)975-3094. Email: dmarson@uab.edu.

Disclosure: The decisional capacity measure used in the study is owned by the UAB Research Foundation (UABRF). Dr. Marson and Dr. Harrell receive royalty income through UABRF.

disability in PD was understood almost exclusively as the result of tremor, bradykinesia, and other motor dysfunction. More recently, increasing attention has been directed towards understanding how cognitive impairment can contribute substantially to functional decline and reduction in quality of life⁴.

One recent area of investigation in PD has concerned medical decision-making capacity (MDC), hereafter also referred to as treatment consent capacity or consent capacity. MDC refers to a patient's cognitive and emotional capacity to accept a proposed treatment, to refuse treatment, or to select among treatment alternatives. It is a crucial element of the informed consent doctrine, which requires a valid consent to be informed, voluntary and also competent⁵. Loss or diminution of consent capacity has important clinical, legal, and ethical implications for patients, their families, and healthcare providers. This is particularly true for PD patients who, as a result of their neurodegenerative disease, must make ongoing treatment and clinical trial research participation decisions, and in circumstances when their decision-making capacity may be increasingly compromised by declining cognition⁶.

Prior work by our group has focused on the treatment consent capacities of PD patients with dementia. Relative to older controls, PD patients with dementia show substantial impairments in MDC as measured by the established consent standards of *understanding*, *reasoning*, *appreciation*, and *choice*². In addition, PD patients with dementia have shown differential impairments in MDC compared to mild AD patients matched for dementia severity⁶. Patients with PD and dementia demonstrated better *understanding* of the treatment situation relative to mild AD patients, but greater difficulty making simple decisional *choices*⁶. Both the PD and AD patient groups were impaired relative to older controls on the clinically relevant consent standards of *understanding*, *reasoning*, and *appreciation*.

An important unanswered question concerns the MDC of PD patients without dementia, but who exhibit milder forms of cognitive impairment⁷⁻⁹. PD patients identified as having milder forms of cognitive impairment have been shown to exhibit multiple cognitive deficits and have higher conversion rates to dementia than PD patients without such cognitive impairments^{9, 10}. However, the extent to which these milder cognitive deficits may also affect decisional capacity is unknown. In the AD literature, patients with amnesic mild cognitive impairment (MCI11), the transitional state to Alzheimer's disease, have been shown to display not only cognitive impairments on psychometric measures, but also emerging performance declines in functional areas such as financial capacity¹² and MDC¹³. The identification of functional changes in the earliest stages of neurodegenerative disease holds important clinical and ethical implications for researchers and clinicians who are working increasingly with MCI and early PD populations.¹⁴

The goal of the present study was to investigate MDC in well-defined groups of elderly controls, cognitively impaired PD patients without dementia, and PD patients with dementia. We hypothesized that, compared to healthy older controls, PD patients without dementia would demonstrate poorer performance on clinically relevant treatment consent standards of *understanding*, *reasoning*, and *appreciation*, due to the PD group's emerging cognitive deficits in memory and executive function. We also hypothesized that the PD patients without dementia would perform significantly better than PD patients with dementia on the same consent standards.

Participants and Methods

Participants

All patients and healthy controls were recruited through the Alzheimer's Disease Research Center (ADRC) at the University of Alabama at Birmingham (UAB). All participants were recruited between 2004-2007 from an ADRC sponsored project investigating medical decision capacity in PD patients. Additional funding for the project was received internally through the Department of Neurology. Control participants had been recruited for the ADRC and were selected for the present study based on matching demographics (i.e., age, education). All participants were diagnostically characterized in ADRC diagnostic consensus conference by a team of neurologists, neuropsychologists, and nursing staff. General exclusion criteria included metabolic diseases, head injuries, large vessel strokes, severe psychiatric illness, and neuro-developmental conditions. All participants gave informed consent to the study procedures as part of this UAB Institutional Review Board-approved research protocol.

Twenty two healthy older adults participated in this study and were screened to ensure the absence of medical and psychiatric conditions that could compromise cognition. Each control was characterized as cognitively normal following ADRC diagnostic consensus conference.

Thirty two patients with PD and cognitive impairment were recruited for the study. Each PD patient was clinically characterized as having idiopathic PD. PD patients were excluded if having a positive history of major psychiatric disorder (including major depression, but excluding minor depression and dysthymia), history of substance abuse, prior neurosurgical intervention, or concomitant medical illness adversely affecting cognition (e.g., obstructive pulmonary disease). Persons with clinical features consistent with Dementia with Lewy Bodies, atypical Parkinsonism, or Alzheimer's disease and with secondary parkinsonism were excluded.

Of the 32 patients described above, 16 PD patients were determined in consensus conference to have a dementia secondary to their PD (hereafter referred to as PDD), based upon a clinical history of (1) movement disorder for at least one year prior to onset of cognitive impairment, (2) neurological findings supporting idiopathic PD, (3) neuropsychological test results indicating cognitive impairment in at least two cognitive domains (≥ 1.5 SD below normal age-matched means), and (4) collateral report of a family member or caregiver for evidence of significant decline in everyday function from premorbid levels. The functional decline was attributable to cognitive and not motor disability by ADRC consensus. Diagnostic criteria for dementia were based upon DSM-IV and consistent with consensus recommendations for PDD diagnosis^{15, 16}.

Using the same diagnostic approach, the remaining 16 PD patients were determined in ADRC consensus conference to have cognitive impairment but not a dementia (hereafter referred to as PD-CIND). The PD-CIND group had (1) a clinical history of movement disorder for at least one year prior to onset of cognitive impairment, (2) neurological findings supporting idiopathic PD, (3) neuropsychological test results indicating impairment (≥ 1.5 SD below normal age-matched means) in at least one cognitive domain, and (4) collateral report of a family member or caregiver that the patient had showed cognitive decline but no more than minimal change in higher order activities of daily living from premorbid baseline. These criteria are consistent with prior published criteria for diagnosis of CIND in other patient groups^{17, 18}, as well as recent consensus recommendations for mild cognitive impairment¹⁹.

All PD patients were taking anti-Parkinsonian medications (see Table 1). Over half of the PDD patients were taking a cholinesterase inhibitor, while five of the PD-CIND patients were taking a cholinesterase inhibitor (see Table 1).

Measures

UPDRS—An abbreviated 10-item version of the Unified Parkinson's Disease Rating Scale (UPDRS)20 (Motor scale items) was administered to all subjects. An abbreviated version was used as not all subjects had completed the full UPDRS, and therefore items were selected that all participants had completed.

Consent Capacity Measure—Consent capacity was assessed with the Capacity to Consent to Treatment Instrument (CCTI),21 a conceptually-based, motor-free, reliable and valid instrument for the assessment of medical decision making ability in healthy and cognitively-impaired older adults. The CCTI consists of two clinical vignettes that each present a hypothetical medical problem (A: neoplasm, B: cardiovascular disease) and symptoms, and two treatment alternatives with associated risks and benefits. Participants were presented the vignettes in both oral and written formats and then answered questions designed to test consent capacity under four core consent standards (Ss) derived from the legal and medical literature21-23:

- S1: simply expressing a treatment choice (*expressing choice*);
- S3: appreciating the personal consequences of a treatment choice (*appreciation*);
- S4: providing rational reasons for a treatment choice (*reasoning*); and
- S5: understanding the treatment situation, and treatment choices and respective risks/benefits (*understanding*).

In addition, we tested a fifth standard described as making the “reasonable” treatment choice [S2]. [S2] is not a clinically accepted consent standard because of concerns about the arbitrariness of the operative term “reasonable.” Therefore, we treat [S2] (*reasonable choice*) as experimental and use brackets to distinguish it from the four core consent standards.

Prior work has demonstrated that the *understanding* (S5) standard to be the most factually intensive and stringent consent standard across a number of neurocognitive conditions24, 25. PD patients with dementia have demonstrated compromised capacity performance as measured by the above described legal standards with the exception of the [S2] standard2. Increasingly compromised performance was found across the standards with most impaired performance found for the *reasoning* (S4) and *understanding* (S5) standards.

CCTI Administration Procedures—Both vignettes were administered in an uninterrupted disclosure format and were counterbalanced across participants to control for potential order effects. Each participant's responses were audio-taped and subsequently transcribed to ensure the highest level of accuracy in scoring. CCTI administration and scoring were performed by trained staff according to detailed and well-operationalized criteria.

Neuropsychological Test Battery—A standardized neuropsychological test battery was administered to all participants as part of their ADRC evaluations. This battery consisted of measures of clinically-relevant neurocognitive domains that are also linked to consent capacity and dementia. Specific tests were the Mini-Mental Status Examination (MMSE) 26; the Dementia Rating Scale, 2nd edition (DRS-2) 27; the Logical Memory subtest of the Wechsler Memory Scale, revised edition (WMS-R)28; the Boston Naming Test29; animal

naming fluency³⁰; Letter fluency³¹, the California Verbal Learning Test, second edition (CVLT-II)³²; Executive Interview (EXIT 25)³³; the Symbol Digit Modalities Test (oral version)³⁴; and the Geriatric Depression Scale (GDS)³⁵.

Data Analyses

Demographic variables were analyzed using one-way analysis of variance (age, education, MMSE, DRS-2 Total Score, and GDS) or χ^2 analyses (gender and race). Group comparisons on the neurocognitive variables were conducted using one-way analysis of variance.

Participants' scores on each CCTI standard were summed across vignettes A and B to create a composite variable (except for [S2], which is unique to vignette A). Comparisons of group performance on these composite (S) variables were performed using one-way analysis of variance (S1, S3, S4, S5) or Kolmogorov-Smirnov Z analysis [S2].

To identify CCTI outcome status (capable, marginally capable, or incapable), we used psychometric cut-off scores derived from control performance. For three of the four interval level standards (S3, S4, and S5), a *capable* outcome was defined as a score greater than 1.5 SD below the control group mean on that S; a *marginally capable* outcome was defined as a score falling at or below 1.5 SD but greater than 2.5 SD below the control group mean on that S; and an *incapable* outcome was defined as a score falling at or below 2.5 SD below the control group mean on that S. Although our assignment of psychometrically-derived cut off scores is potentially arbitrary, it reflects current methodology for defining impairment and has been successfully employed in prior capacity studies². For the fourth interval level data standard (S1), which has a maximum possible score of 4, a *capable* outcome was defined as a score of 4; *marginally capable* as a score of 3; and *incapable* as a score ≤ 2 . Because [S2] is a dichotomous variable, there were only two possible outcomes – *capable* (1 point) or *incapable* (0 point).

All analyses were performed using SPSS 15.0.

Results

Demographics

Demographic results are presented in Table 1. No significant between group differences were found for age, education, or in gender or racial distributions. The controls and PD-CIND groups did not differ on the MMSE or DRS-2 Total Score, but both groups performed better than the PDD group. The composite UPDRS score was significantly higher for both PD groups compared to controls, and as expected the PDD group had higher UPDRS scores compared to the PD-CIND group. Both PD-CIND and PDD groups endorsed higher self-reported depression scores (GDS) compared to controls. Neuropsychological test results are presented in Table 2 and relative to controls reflected cognitive impairments for both the PD-CIND group and the PDD group.

Performance on the CCTI

Table 3 presents the CCTI performance of the three groups. On S1 (*expressing choice*), there were no between group differences. Similarly, there were no group differences in the ability to express a *reasonable choice* [S2]. However, on the three more stringent and clinically relevant consent standards³⁶ of *understanding* (S5), *reasoning* (S4), and *appreciation* (S3), PDD patients performed significantly below both controls and PD-CIND patients. PD-CIND patients, in turn, performed significantly below controls on the *understanding* (S5) consent ability, and equivalently on the *reasoning* (S4) and *appreciation* (S3) consent abilities.

Capacity Outcome Classification for the PD-CIND and PDD Groups

Table 4 presents PD-CIND and PDD group capacity outcomes (capable, marginally capable, incapable) across the five consent standards. Both patient groups displayed the highest proportion of capacity compromise (defined as the combination of marginally capable and incapable outcomes) on the *understanding* standard (S5).

Discussion

Prior work has identified and characterized the cognitive deficits associated with advancing Parkinson's disease¹⁶, as well as the early cognitive manifestation of the disease^{8, 10}. However, limited attention has been directed towards understanding aspects of functional change in the disease, particularly in regard to higher order activities of daily living. The present study compared the performance of older controls and cognitively impaired PD patients with and without dementia on a standardized, motor-free measure of MDC. Prior studies by our group have demonstrated that PD patients with dementia exhibit impaired performance on standardized measures of MDC^{2, 6}. The present study sought to extend this research by investigating MDC in PD patients with milder forms of cognitive impairment without dementia.

We found that, compared to a demographically comparable group of healthy older adults, PD-CIND patients were impaired in the ability to understand the medical treatment situation and choices (S5). This impairment was reflected in both the PD-CIND group's S5 performance score and in the capacity outcome compromise level (31%). Prior work with the CCTI has consistently shown that S5 is the most difficult consent standard for patients with dementia^{2, 6, 21}, as it is factually intensive and requires the encoding, and also mental organization, of a considerable amount of medical information. We have previously found in PD patients with dementia that impairment on S5 was significantly associated with executive dysfunction². Thus, consistent with our initial hypothesis, PD-CIND patients in the present study showed an emerging impairment in the *understanding* element of decisional capacity that may relate to this group's impairments in both short term verbal memory and executive function (see Table 2).

However, the study hypothesis concerning impaired MDC in PD-CIND was only partially confirmed. In comparison to the control group, the PD-CIND patient group performed equivalently across all remaining consent standards. Although the PD-CIND group's raw score on *reasoning* (S4) fell below that of controls, the difference in this sample was not statistically different and the level of capacity compromise was mild (12%). The PD-CIND group also performed at or very near control levels on both *expressing choice* (S1) and *appreciation* (S3). With respect to capacity outcomes, there were suggestions of incipient impairment in the PD-CIND group on *expressing choice* (S1) (19% compromise) and also *appreciation* (S3) (25% compromise). Like the other groups, PD-CIND patients had no difficulty making the *reasonable choice* [S2]. Overall, these findings indicate that the primary decisional deficit in patients with PD-CIND involves the efficient encoding and organization of new medical information, and not reasoning with or personally appreciating that information.

Capacity findings for the PDD group replicated findings from prior studies^{2, 6}. Compared to the control and PD-CIND groups, the PDD group was impaired on the three clinically relevant consent standards of *understanding*, *reasoning*, and *appreciation*. Impairment was particularly evident regarding PDD patients' ability to understand the medical treatment situation and choices (S5). More than 80% of the PDD group demonstrated capacity outcome compromise on this standard, and the PDD group's mean raw score on S5 was only 61% that of control group. PDD patients also demonstrated performance impairment and

outcome compromise on the *reasoning* (S4) and *appreciation* (S3) standards, though not to the same degree as on *understanding*. These results reaffirm that patients with PDD have decisional impairments across multiple aspects of MDC.

There are several limitations to the present study. First, the study involved small sample sizes which necessitate caution regarding the generalizability of the findings. However, despite the small sample sizes, we found statistically significant group differences between controls, PD-CIND and PDD patients on the most stringent and clinically relevant CCTI standard. We also found significant differences between PDD patients, and controls and PD-CIND patients, on two other clinically relevant standards. These findings are further strengthened by the fact that all three groups were equated for age, education, gender and racial distribution. Second, participants' responses on the CCTI vignettes arguably may not fully reflect decisions they might make when faced with real world, personal medical situations. In particular, the CCTI, like other objective capacity instruments, does not capture emotional aspects of medical decision-making that may inform real life decisions. Third, it should be kept in mind that the study's capacity outcomes represent applications of psychometric cut-off scores derived from the control group performance, and are not clinical or legal determinations of MDC. Instruments like the CCTI are intended to support but not substitute for clinical judgments of capacity.

The present study highlights the importance of assessing the decision-making abilities of PD patients with mild cognitive dysfunction, as well as those with dementia. The study findings indicate that there is emerging decisional capacity impairment in PD-CIND patients, which appears to progress over time as these patients enter into a full dementia⁶. Accordingly, clinicians and researchers should carefully assess decisional capacity in all PD patients with cognitive impairment

Acknowledgments

This research was supported by the National Institute on Aging through a pilot research grant of the Alzheimer's Disease Research Center (1P50 AG16582) (Marson, PI) and grant 1R01 AG021927 (Marson, PI), and also by philanthropic support provided to the UAB Department of Neurology. The authors thank the staff of the Neuropsychology Laboratory in the Department of Neurology for their assistance with data collection.

References

1. Leopold NA, Polansky M, Hurka MR. Drug adherence and Parkinson's disease. *Movement Disorders*. 2004; 19(5):513–517. [PubMed: 15133814]
2. Dymek M, Atchison P, Harrell L, Marson D. Competency to consent to treatment in cognitively impaired patients with Parkinson's disease. *Neurology*. 2001; 56:17–24. [PubMed: 11148230]
3. Singh R, Pentland B, Hunter J, Provan F. Parkinson's disease and driving ability. *J Neurol Neurosurg Psychiatry*. 2007; 78(4):363–366. [PubMed: 17178820]
4. Sabbagh M, Lahti T, Connor D, et al. Functional ability correlates with cognitive impairment in Parkinson's disease and Alzheimer's disease. *Dementia and Geriatric Cognitive Disorders*. 2007; 24:327–334. [PubMed: 17851237]
5. Grisso, T.; Appelbaum, P. *Assessing competence to consent to treatment: A guide for physicians and other health professionals*. New York: Oxford University Press; 1998.
6. Griffith H, Dymek MP, Atchison P, Harrell L, Marson D. Medical decision-making in neurodegenerative disease: Mild AD and PD with cognitive impairment. *Neurology*. 2005; 65:483–485. [PubMed: 16087924]
7. Caviness JN, Driver-Dunckley E, Connor DJ, et al. Defining mild cognitive impairment in Parkinson's disease. *Movement Disorders*. 2007; 22(9):1272–1277. [PubMed: 17415797]

8. Janvin C, Aarsland D, Larsen JP, Hugdahl K. Neuropsychological profile of patients with Parkinson's disease without dementia. *Dement Geriatr Cogn Disord*. 2003; 15(3):126–131. [PubMed: 12584427]
9. Janvin C, Larsen JP, Aarsland D, Hugdahl K. Subtypes of mild cognitive impairment in Parkinson's disease: progression to dementia. *Movement Disorders*. 2006; 21(9):1343–1349. [PubMed: 16721732]
10. Woods S, Troster A. Prodromal frontal/executive dysfunction predicts incident dementia in Parkinson's disease. *Journal of the International Neuropsychology Society*. 2003; 9:17–25.
11. Petersen R, Doody R, Kurz A, et al. Current concepts in mild cognitive impairment. *Archives of Neurology*. 2001; 58:1985–1992. [PubMed: 11735772]
12. Griffith H, Belue K, Sicola A, et al. Impaired financial abilities in mild cognitive impairment: A direct assessment approach. *Neurology*. 2003; 60(3):449–457. [PubMed: 12578926]
13. Okonkwo O, Griffith H, Belue K, et al. Medical decision-making capacity in patients with mild cognitive impairment. *Neurology*. 2007; 69:1528–1535. [PubMed: 17923615]
14. Kim S, JHT K, Caine E. Current state of research on decision-making competence of cognitively impaired elderly persons. *American Journal of Geriatric Psychiatry*. 2002; 10:151–165. [PubMed: 11925276]
15. American Psychiatric Association. *Diagnostic and Statistical Manual of Mental Disorders (DSM-IV-TR)*. 4th. Washington, D.C.: American Psychiatric Association; 2000.
16. Emre M, Aarsland D, Brown R, et al. Clinical diagnostic criteria for dementia associated with Parkinson's disease. *Mov Disord*. Sep 15; 2007 22(12):1689–1707. quiz 1837. [PubMed: 17542011]
17. Ingles JL, Fisk JD, Merry HR, Rockwood K. Five-year outcome for dementia define solely by neuropsychological test performance. *Neuroepidemiology*. 2003; 22(3):172–118. [PubMed: 12711849]
18. Tuokko H, Frerichs RJ, Graham J, et al. Five-year follow-up cognitive impairment with no dementia. *Arch Neurol*. 2003; 60(4):577–582. [PubMed: 12707072]
19. Winblad B, Palmer K, Kivipelto M, et al. Mild cognitive impairment - beyond controversies, towards a consensus: report of the International Working Group on mild cognitive impairment. *Journal of Internal Medicine*. 2004; 256:240–246. [PubMed: 15324367]
20. Fahn, S.; Elton, R. Committee MotUD. Unified Parkinson's Disease Rating Scale. In: Fahn, S.; Marsden, C.; Caine, D.; Lieberman, A., editors. *Recent Developments in Parkinson's Disease*. Florham Park, NJ: Macmillan Health Care Information; 1987. p. 153-163.
21. Marson DC, Ingram KK, Cody HA, Harrell LE. Assessing the competency of patients with Alzheimer's disease under different legal standards. *Archives of Neurology*. 1995; 52:949–954. [PubMed: 7575221]
22. Dymek MP, Marson DC, Harrell L. Factor structure of capacity to consent to medical treatment in patients with Alzheimer's disease: An exploratory study. *Journal of Forensic Neuropsychology*. 1999; 1:27–48.
23. Appelbaum P, Grisso T. Assessing patients' capacities to consent to treatment. *New England Journal of Medicine*. 1988; 319:1635–1638. [PubMed: 3200278]
24. Marson DC, Chatterjee A, Ingram KK, Harrell LE. Toward a neurologic model of competency: Cognitive predictors of capacity to consent in Alzheimer's disease using three different legal standards. *Neurology*. Mar; 1996 46(3):666–672. [PubMed: 8618664]
25. Okonkwo O, Griffith HR, Belue K, et al. Medical decision-making capacity in patients with mild cognitive impairment. *Neurology*. Oct 9; 2007 69(15):1528–1535. [PubMed: 17923615]
26. Folstein M, Folstein S, McHugh P. Mini-Mental State: A practical guide for grading the cognitive state of the patient for the physician. *Journal of Psychiatry Research*. 1975; 12:189–198.
27. Jurica, PJ.; Leitten, CL.; Mattis, S. *Dementia Rating Scale-2: Professional manual*. Lutz, FL: Psychological Assessment Resources; 2001.
28. Wechsler, D. *Wechsler Memory Scale--Revised*. New York: The Psychological Corporation; 1987.
29. Kaplan, E.; Goodglass, H.; Weintraub, S. *Boston Naming Test*. Philadelphia: Lea & Febiger; 1983.

30. Spreen, O.; Strauss, E. A Compendium of Neuropsychological Tests. New York, NY: Oxford University Press; 1991.
31. Benton, AL.; Hamsher, KdS. Multilingual Aphasia Examination (3rd Edition). Iowa City: AJA; 1994.
32. Delis, D.; Kramer, J.; Kaplan, E.; Ober, B. CVLT-II California Verbal Learning Test. San Antonio, TX: The Psychological Corporation; 2000.
33. Royall D, Mahurin R, Gray K. Bedside assessment of executive cognitive impairment: The Executive Interview. *Journal of the American Geriatrics Society*. 1992; 40:1221–1226.
34. Smith, A. Symbol Digit Modalities Test (SDMT). Manual (Revised). Los Angeles: Western Psychological Services; 1982.
35. Yesavage J. Development and validation of a geriatric depression screening scale: A preliminary report. *Journal of Psychiatric Research*. 1983; 17:37–49. [PubMed: 7183759]
36. Tepper A, Elwork A. Competency to consent to treatment as a psychological construct. *Law and Human Behavior*. 1984; 8:205–223. [PubMed: 11659145]

Table 1

Demographic and clinical characteristics of study participants

Variable	Controls n = 22	PD-CIND n = 16	PDD n = 16	F	p [†]	post hoc
Age	68.0 (8.4)	65.4 (8.9)	70.9 (6.3)	1.9	.16	---
Gender, n (%)						
Female	13 (59)	7 (44)	4 (25)	---	---	---
Male	9 (41)	9 (56)	12 (75)			
Race, n (%)						
African American	5 (23)	2 (13)	0 (0)	---	---	---
Caucasian	17 (77)	14 (87)	16 (100)			
Education	15.1 (3.0)	15.1 (2.4)	15.5 (3.1)	.12	.89	---
MMSE	29.5 (1.1)	29.1 (1.1)	26.2 (2.5)	21.1	.001	C, PD-CIND > PDD
DRS-2 Total Score	138.9 (3.2)	135.3 (5.0)	119 (11.2)	40.5	.001	C, PD-CIND > PDD
UPDRS (sum of shared)	0.7 (2.6)	7.9 (4.1)	12.6 (4.5)	49.3	.001	C < PD-CIND < PDD
GDS	5.8 (5.2)	11.4 (8.6)	9.8 (3.3)	4.5	.02	C < PD-CIND, PDD
PD Medications	--	8	13			
Carbidopa/levodopa						
Carbidopa/levodopa/entacapone	--	5	2			
Pramipexole	--	1	4			
Ropinirole	--	5	3			
Amantadine	--	1	3			
Entacapone	--	0	2			
Trihexyphenidyl	--	1	1			
Cholinesterase inhibitor						
Donepezil	--	4	6			
Galantamine	--	0	2			
Rivastigmine	--	1	1			

Pearson chi-square for gender = 4.3, $p = .12$, Pearson chi-square for race = 4.2, $p = .13$.

Except for gender and race, values are mean (SD).

[†] p value for omnibus test of group differences.

PD-CIND = Parkinson's disease with cognitive impairment but no dementia

PDD = Parkinson's disease dementia

MMSE = Mini-Mental Status Examination

DRS-2 = Dementia Rating Scale, 2nd edition

GDS = Geriatric Depression Scale.

Table 2
Group comparisons on selected neuropsychological measures

Measures	Range	Controls n = 22	PD-CIND n = 16	PDD n = 16	F	p	LSD post-hoc p < .05
Attention							
DRS-2 Attention	0-37	36.0 (1.6)	34.9 (2.3)	33.0 (2.9)	8.4	.001	C, PD-CIND > PDD
Visual-Spatial							
DRS-2 Construction	0-6	5.9 (.29)	5.9 (.34)	5.1 (1.1)	7.9	.001	C, PD-CIND > PDD
Expressive language							
Boston Naming	0-30	27.8 (3.6)	26.9 (1.9)	25.1 (3.5)	3.4	.04	C > PDD
CFL Letter Fluency		40.9 (10.3)	32.3 (11.8)	21.4 (9.8)	15.4	.001	C > PD-CIND > PDD
Animal Fluency		21.4 (5.1)	18.5 (6.0)	10.9 (5.7)	17.0	.001	C, PD-CIND > PDD
Memory							
DRS-2 Memory	0-25	23.7 (1.1)	22.8 (1.4)	20.1 (2.9)	17.2	.001	C, PD-CIND > PDD
Logical Memory I	0-50	26.6 (4.8)	20.3 (5.2)	14.1 (6.5)	24.4	.001	C > PD-CIND > PDD
Logical Memory II	0-50	23.1 (6.0)	15.2 (6.4)	9.9 (7.1)	20.3	.001	C > PD-CIND > PDD
CVLT-2 Total Recall	0-80	46.1 (7.1)	39.6 (11.0)	24.9 (5.1)	33.4	.001	C > PD-CIND > PDD
Abstraction							
DRS-2 Conceptualization	0-39	36.6 (2.3)	36.3 (2.8)	31.0 (3.7)	19.7	.001	C, PD-CIND > PDD
Executive function							
DRS-2 I/P	0-37	36.7 (0.5)	35.34 (2.5)	29.8 (5.1)	24.8	.001	C, PD-CIND > PDD
Symbol Digits Modalities – Oral version	0-110	53.4 (11/4)	40.2 (8.4)	16.1 (9.8)	60.1	.001	C > PD-CIND > PDD
Executive Interview (EXIT)	0-50	6.6 (3.7)	10.5 (3.3)	17.3 (5.6)	22.5	.001	C > PD-CIND > PDD

PD-CIND = Parkinson's disease cognitive impairment no dementia, PDD = Parkinson's disease dementia

DRS = Dementia Rating Scale-2, CVLT-2 = California Verbal Learning Test-2.

C, PD-CIND > PDD = control and PD-CIND means are greater than PDD mean

C > PDD = control mean greater than PDD mean and PD-CIND mean is not different than either control or PDD mean

C > PD-CIND > PDD = control mean greater than PD-CIND mean which in turn is greater than PDD mean

Table 3
Group Comparisons on Consent Standards (S)

Measures	Range	Controls, n = 22	PD-CIND n = 16	PDD n = 16	F	p [†]	post hoc
S1, expressing choice	0-4	3.8 (0.4)	3.8 (0.4)	3.7 (0.6)	.43	.66	---
[S2], reasonable choice, n (%)	0-1						
Yes		22 (100)	16 (100)	16 (100)			---
No		0 (0.0)	0 (0.0)	0 (0.0)			
S3, appreciation	0-8	7.6 (0.8)	7.0 (1.2)	6.3 (2.0)	4.3	.02	C, PD-CIND > PDD
S4, reasoning	0-12	9.0 (2.8)	7.9 (2.8)	5.6 (3.1)	6.4	.003	C, PD-CIND > PDD
S5, understanding	0-78	61.9 (9.5)	52.9 (10.6)	37.6 (12.7)	15.2	.001	C > PD-CIND > PDD

Except for [S2], all values are mean (SD).

[†] p value for omnibus test of group differences.

PD-CIND = Parkinson's disease with cognitive impairment but no dementia

PDD = Parkinson's disease dementia

C, PD-CIND > PDD = control and PD-CIND means are greater than PDD mean

C > PDD = control mean greater than PDD mean, and PD-CIND mean is not different than either control or PDD mean

C > PD-CIND > PDD = control mean greater than PD-CIND mean which in turn is greater than PDD mean

Table 4
Capacity outcomes for patients with PD-CIND and PDD

	Capable	Marginally Capable	Incapable	Z	p
S1, evidencing choice					
PD-CIND	81% (13/16)	19% (3/16)	00% (0/16)	.50	.72
PDD	75% (12/16)	19% (3/16)	06% (1/16)		
[S2], reasonable choice					
PD-CIND	100% (16/16)	-----	00% (0/16)	-----	
PDD	100% (16/16)	-----	00% (0/16)		
S3, appreciating consequences					
PD-CIND	75% (12/16)	06% (1/16)	19% (3/16)	.97	.42
PDD	56% (9/16)	19% (3/16)	25% (4/16)		
S4, reasoning about treatment					
PD-CIND	88% (14/16)	12% (2/16)	00% (0/16)	1.4	.34
PDD	69% (11/16)	19% (3/16)	12% (2/16)		
S5, understanding treatment					
PD-CIND	69% (11/16)	19% (3/16)	12% (2/16)	2.8	.008
PDD	19% (3/16)	38% (6/16)	43% (7/16)		

Z = Kolmogorov-Smirnov Z test.
PD-CIND = Parkinson's disease with cognitive impairment but no dementia
PDD = Parkinson's disease dementia
S = consent standard