

Utility of the Virtual Reality Functional Capacity Assessment Tool (VRFCAT) in Parkinson's disease.



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OBJECTIVE

Regulatory agencies are increasingly focused on measures of meaningful functional improvement to assess outcome of symptomatic and disease-modifying therapies. The Virtual Reality Functional Capacity Assessment Tool (VRFCAT)¹ is a digital tablet-based instrument that assesses proficiency for performing real world tasks in a highly realistic environment. Examinees are challenged to locate items for a recipe in a kitchen, use a bus schedule, shop in a supermarket, and make purchases using exact change. The VRFCAT was previously validated in schizophrenia and older adults with subjective cognitive decline^{2,3}. The present study examines feasibility and utility for evaluating functioning with the VRFCAT in patients with mild to moderate Parkinson's disease (PD).

METHODS

Retrospective chart review examined VRFCAT performances in 30 patients meeting UK Brain Bank criteria for idiopathic PD who underwent comprehensive neuropsychological evaluation at a tertiary care clinic. Diagnosis of Mild Cognitive Impairment (PD-MCI) and dementia (PDD) was consistent with Movement Disorder Society Task Force Level II criteria, and was independent of VRFCAT performance. Performance outcomes from the VRFCAT included completion time, errors, and forced progressions. Associations of VRFCAT performance with cognitive status, disease progression, standardized neuropsychological tests (e.g., Trail Making, Hopkins Verbal Memory Test, Digit Span, etc.) and a self-report scale for impact of cognition on instrumental Activities of Daily Living (iADLs) were examined.

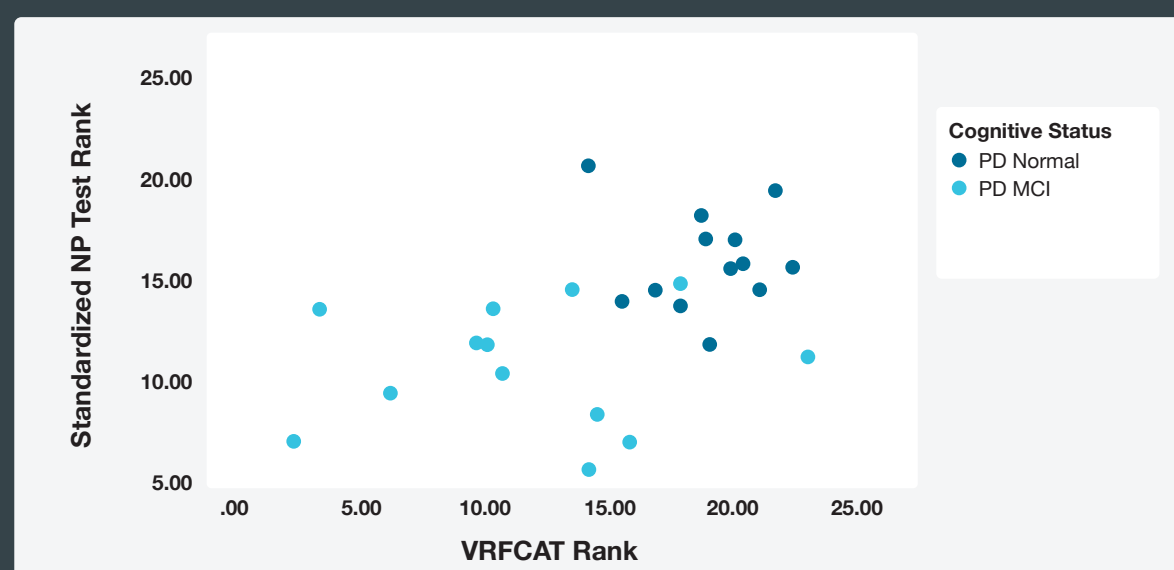
SAMPLE

One patient (78 years old, no cognitive impairment) was unable to complete the VRFCAT due to macular degeneration and inability to distinguish features of objects on the video display. Demographic and clinical characteristics of the **29 patients** (12 female) who successfully completed the task are shown in the table on the right. Fifteen were diagnosed with PD-MCI; no patients met criteria for PDD.

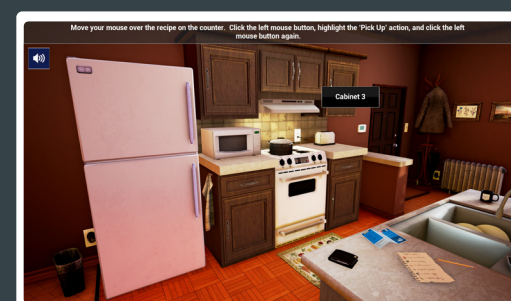
RESULTS

Cognitive Status: PD-MCI patients (n=15) took longer and made more errors on the VRFCAT than PD patients with normal cognition (n=14). The average rank for VRFCAT performance measures was associated with global rank on standardized neuropsychological tests (higher is better), Spearman's rho=.507, p=.007.

	PD Normal Mean (SD)	PD-MCI Mean (SD)	Difference
Time (sec)	637 (22)	935 (66)	p<.0005
Errors	1.21 (.32)	3.53 (.62)	p=.003
Forced Progressions	0 (0)	.33 (.16)	p=.115



EXAMPLE SCREENSHOTS OF VRFCAT



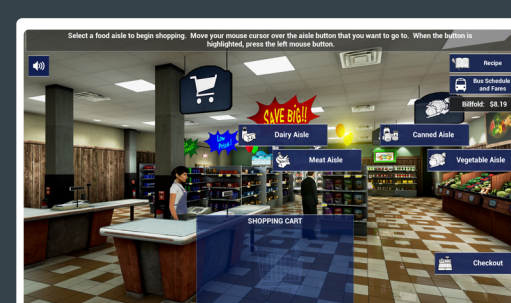
Kitchen

Search the kitchen for items on recipe



Bus Stop

Use a bus schedule and get on the correct bus



Grocery Store

Find and purchase items from a grocery store

	Min	Max	Mean (SD)
Age	54	79	66.62 (7.64)
Education	11	20	15.66 (2.38)
Duration of Illness	2	20	8.66 (4.79)
HY Stage	1.0	3.0	2.38 (.53)
LEDD	0	2180	980.45 (471.45)
MDS-UPDRS	9	49	29.45 (11.38)

CONCLUSION

Results from this study demonstrated feasibility and utility of the VRFCAT in assessing cognitive aspects of performing tasks associated with everyday living in people with mild to moderate Parkinson's disease. As expected, PD-MCI patients performed worse than PD normal cognition patients, and those with more advanced disease performed more slowly. Demographic and other clinical factors did not confound performance. Failure of PD-MCI patients to recognize impact of cognition on efficiency for iADLs indicates that self-report measures are not well-suited for this purpose in PD. **Taken together, results support use of the VRFCAT as an objective measure of functional capacity for iADLs in Parkinson's disease.**

References:

- Ruse SA, Davis VG, Atkins AS, Krishnan KR, Fox KH, Harvey PD, Keefe RS. Development of a virtual reality assessment of everyday living skills. Journal of Visual Experiments. 2014 Apr 23;(86)
- Harvey PD, Khan A, Atkins A, Keefe RS. Virtual reality assessment of functional capacity in people with Schizophrenia: Associations with reduced emotional experience and prediction of functional outcomes. Psychiatry Res. 2019 Jul;277:58-63.
- Atkins AS, Khan A, Ulshen D, Vaughan A, Balentin D, Dickerson H, Liharska LE, Plassman B, Welsh-Bohmer K, Keefe RSE. Assessment of Instrumental Activities of Daily Living in Older Adults with Subjective Cognitive Decline Using the Virtual Reality Functional Capacity Assessment Tool (VRFCAT). J Prev Alzheimers Dis. 2018;5(4):216-234.
- Kulisevsky J, Fernández de Bobadilla R, Pagonabarraga J, Martínez-Horta S, Campolongo A, García-Sánchez C, Pascual-Sedano B, Ribosa-Nogué R, Villa-Bonomo C. Measuring functional impact of cognitive impairment: validation of the Parkinson's disease cognitive functional rating scale. Parkinsonism Relat Disord. 2013 Sep;19(9):812-7.



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