ASSESSMENT OF AGE-RELATED DIFFERENCES IN INSTRUMENTAL ACTIVITIES OF DAILY LIVING USING THE VIRTUAL REALITY FUNCTIONAL ASSESSMENT TOOL (VRFCAT)

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BACKGROUND

Reliable evaluation of cognitive performance and functional capacity is critical to the effective assessment of mental health in aging individuals at risk for MCI/AD. Although the assessment of cognitive decline is largely standardized with the use of performance-based neuropsychological instruments, assessment of functional capacity relies heavily on partner-reported measures that require the availability of a competent informant and lack subjective validity for MCI and prodromal MCI/AD (Marshall et al., 2012; Gomar et al., 2011). Increasing interest in clinical trials for primary prevention and early intervention highlights the need for instruments that are sensitive to functional capacity deficits in healthier, non-demented individuals.

The Virtual Reality Functional Capacity Assessment Tool (VRFCAT) was developed as a direct performance-based assessment of functional capacity of older adults in function across multiple populations. Using a realistic virtual environment, the VRFCAT assesses a subject’s ability to complete instrumental activities associated with a shopping trip, including searching the pantry at home, making a grocery list, taking the correct bus to the stop, shopping for groceries, paying for the groceries, and returning home. The VRFCAT includes multiple forms to allow for repeated testing with minimal practice effects. In previous studies, the VRFCAT has demonstrated high test-retest reliability and has shown sensitivity to functional impairment (Rhee et al., 2014).

The primary aims of the present study were to (1) examine age-related differences in VRFCAT performance to assess the sensitivity of the measure to functional declines associated with normal aging, (2) examine the relationship between VRFCAT performance and cognition in both young and older adults, and (3) to examine test-retest reliability of the VRFCAT for potential use in young and healthy aging populations.

METHODS

SUBJECTS

- Participants included 44 healthy Young Adults (YA) ages 18-30 (24 male, 20 female), and 41 healthy Older Adults (OA) ages 55-70 (17 male, 24 female).
- Participants were recruited from the University of California – San Diego, the University of Miami Miller School of Medicine, and the University of South Carolina.
- Participants provided detailed information regarding computer use and experience.
- 100% of YAs and 90% of OAs indicated a high level of familiarity and comfort with computers.

PROCEDURE

- Functional capacity was assessed with both the VRFCAT and the UPSA-2-VIM, which is a standard rater-administered performance-based measure of functional capacity utilizing physical props and materials.
- Randomized alternate forms of the VRFCAT were administered at Visit 1 and Visit 2.
- Cognitive performance was assessed using the MATRICS Consensus Cognitive Battery (MCCB) which assesses speed of processing, attention, working memory, verbal learning, visual learning, reasoning and problem solving, and social cognition.
- Key outcome measures for the VRFCAT included (1) Total Time to complete all objectives, (2) Total Errors, and (3) Total Forced Progressions, which occur following repeated failure at a given task.
- Additional VRFCAT outcomes included completion time and error rates for each of 12 VRFCAT objectives as well as the number of times subjects consulted reference materials (recipe, bus schedule) for reminders during task completion.
- Analyses examined age differences in performance as well as correlations between functional and cognitive outcomes.

RESULTS

AVERAGE TIME TO COMPLETION ON VRFCAT OBJECTIVES FOR YOUNG & OLDER ADULTS

- The VRFCAT demonstrated strong age-related differences in performance on Total Time, Total Errors, and Total Forced Progressions (p<.001 for all).
- OAs took significantly longer than YAs on all VRFCAT tests; age differences in completion time were largest for objectives 3, 9, 10, and 12.
- OAs made significantly more errors on objectives 3, 7, 9, 10, and 12.
- UPSA-2-VIM total score was not sensitive to differences between age groups (p=.562).
- UPSA-2-VIM total score was strongly correlated with VRFCAT Total Time in both groups (r=.72 for YA; r=.81 for OA; p<.001 for both), suggesting the measures assess similar constructs.

RELATIONSHIP TO COGNITIVE FUNCTION

- VRFCAT Total Time and UPSA-2-VIM were strongly correlated with the MCCB as well as many MCBR subtests for both YAs and OAs.
- The VRFCAT Completion Time had a strong positive correlation with the MSCEIT for both age groups.
- Cognitive performance was assessed using the MATRICS Consensus Cognitive Battery (MCCB) for both Young Adults and Older Adults.
- The UPSA-2-VIM Total Score correlated strongly with the MCCB in both age groups.

VRFCAT RELIABILITY AND PRACTICE EFFECTS

- VRFCAT Total Time demonstrated retest reliability, ICC=.80 for OAs and ICC=.64 in YAs.
- The VRFCAT demonstrated small, insignificant practice effects in both YAs and OAs.
- The UPSA-2-VIM Total Score demonstrated large practice effects in both OAs and YAs, suggesting this measure may not be suitable for repeated testing in these healthy subject groups.

CORRELATIONS BETWEEN FUNCTIONAL CAPACITY MEASURES & COGNITION

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CONCLUSIONS

- Assessment of functional capacity in primary prevention and preclinical MCI/AD trials requires measures with improved sensitivity to changes in non-demented individuals.
- Many studies rely on partner-reported measures that lack sensitivity to subtle functional deficits; performance-based measures represent a viable alternative.
- The VRFCAT is a reliable performance-based measure with sensitivity to age-related differences in functional capacity.
- 90% of OAs indicated a high degree of familiarity and comfort with computers, indicating computerized testing is appropriate in this population.
- Findings provide preliminary support for the VRFCAT as a sensitive and reliable co-prime measure of functional capacity in primary prevention and prodromal AD trials.

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