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Consumer Acceptability of Brief Videoconference-based Neuropsychological Assessment in Older Individuals with and without Cognitive Impairment

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Abstract

Growing evidence suggests that neuropsychological assessment via videoconference shows good agreement with traditional in-person assessment. However, there are few published studies regarding patient acceptability of this methodology, particularly in individuals with cognitive impairment. In this study we sought to evaluate patient preferences and acceptability of teleneuropsychology to further shed light on the viability of this cognitive assessment medium. We examined acceptability of videoconference-based neuropsychological assessment among healthy aging individuals and in subjects with mild cognitive impairment or early stage Alzheimer disease. We found that teleneuropsychology appears to be well accepted by consumers. Our results reflected 98% satisfaction, and roughly 2/3 of participants indicated no preference between traditional face-to-face testing and examination by teleneuropsychology. Furthermore, even participants with cognitive impairment showed good acceptability of teleneuropsychological assessment. In conjunction with the preliminary data on reliability and validity from this growing literature, these results support teleneuropsychology as a viable and acceptable method for assessing cognitive functioning, and show promise for the implementation and utilization of this cognitive assessment medium in clinical and research settings.

Introduction

The use of telemedicine (i.e., the use of telecommunication and information technologies in order to provide clinical health care remotely) in mental health care has seen immense growth over the past ten years, and telemental health has been accepted as a valid and reliable method of interview, evaluation, and intervention (Cruz, Krupinski, Lopez, & Weinstein, 2005; Godleski, Nieves, Darkins, & Lehmann, 2008; Monnier, Knapp, & Frueh, 2003; Myers & Turvey, 2012; Norman, 2006; O'Reilly, Bishop, Maddox, et al., 2007;

Ruskin, Silver-Aylaian, Kling, et al., 2004; Tuerk, Fortney, Bosworth, et al., 2010). The telemental health literature indicates good overall patient and clinician acceptability with videoconference-based care in a variety of populations and settings. For example, in an early investigation, Bishop, O'Reilly, Maddox, and Hutchinson, (2002) found that patients treated face to face and patients seen via videoconference reported comparable satisfaction with services. Chong and Moreno (2012) actually found provider alliance and overall satisfaction to be higher than treatment as usual among a group of low-income Hispanic patients with depression. Shore, Brooks, Savin, et al., (2007) found patient satisfaction, comfort, and cultural acceptance was comparable to in-person psychiatric evaluation in American Indian veterans. Despite some concerns regarding the potential for technological and interpersonal barriers (Urness, Wass, Gordon, et al., 2006; Wagnild, Leenknecht, & Zauher, 2006), patients and clinicians report good acceptability of telepsychiatry services.

Less is known about the acceptability of videoconference technology in the assessment of cognitive functioning, though preliminary results are promising. Growing evidence suggests that teleneuropsychology shows good agreement with traditional in-person assessment (Jacobsen, Sprenger, Andersson, & Krogstad, 2003; Kirkwood, Peck, & Bennie, 2001; Hildebrand, Chow, Williams, et al., 2004; Loh, Ramesh, Maher, et al., 2004; Vestal, Smith-Olinde, Hutton, & Hart, 2006). A feasibility study of teleneuropsychology in older subjects with and without dementia found correlations between 0.5 and 0.8 on a brief battery of common neuropsychological tools administered in-person and via videoconference (Cullum, Weiner, Gehrmann, & Hynan, 2006). Overall, it appears that measures relying primarily on verbal instructions and responses may be more reliable than others, although various tasks may be amenable to modification to suit the videoconference environment (see Cullum and Grosch, 2012). Furthermore, a variety of videoconference-based assessments have shown clinical utility and efficacy in the diagnosis of dementia, brain injury, and other neurological disorders (Clement, Brooks, Dean, & Galaz 2001; Lee, Kim, Jhoo, et al., 2000; Loh, Donaldson, Flicker, et al., 2007; Lott, Doran, Walsh, & Hill, 2006; Shores, Ryan-Dykes, Williams, et al., 2004; Weiner, Rossetti, & Harrah, 2011).

The use of videoconference technology by neuropsychologists could greatly expand provider reach and patient care as evidenced by the growth of telemental health services. However, despite promising results supporting the feasibility and reliability of teleneuropsychology, there are few published studies regarding patient acceptability of this methodology, particularly in populations with cognitive impairment. Preliminary findings from telemental health studies involving teleneuropsychology have anecdotally noted good patient and clinician acceptability (Jacobsen et al., 2003; Ramos-Rios, Mateos, Lojo, et al., 2012; Vestal et al., 2006). In a study of dementia diagnosis in residential care veterans, Shores et al. (2004) found that most patients preferred completing the evaluation via video teleconference rather than traveling to a clinic. Hildebrand et al. (2004) reported that all patients evaluated by teleneuropsychology were comfortable with the testing session. Broader evaluation of patient preferences and a more systematic examination of acceptability of teleneuropsychological services will further shed light on the viability of this cognitive assessment medium in clinical and research settings. For the purpose of this investigation, we examined the acceptability of teleneuropsychology among healthy aging individuals and in subjects with cognitive impairment. Based on our experience and positive findings in other aspects of the telemental health literature, it was hypothesized that participants would endorse good acceptability of videoconference-based neuropsychological testing.

Methods

Participants

As part of a larger IRB-approved investigation of the reliability and validity of teleneuropsychological assessment, 40 community-based participants in the Dallas, Texas metro area completed an acceptability survey after undergoing a brief battery of standard neuropsychological tests both in-person and via videoconference. Subjects ranged in age from 50–82 [mean (SD) = 70.8 (8.6)], with 10–20 years of education [mean (SD) = 15.1 (2.5)], and 62% were female. Participants were diagnosed *a priori* via multidisciplinary consensus using standard criteria as healthy controls (n = 21) or as cognitively impaired (Alzheimer disease n = 7, Mild Cognitive Impairment n = 12), Mini-Mental State Exam (Folstein, Folstein, & McHugh, 1975) scores ranged from 22 to 30 [mean (SD) = 27.5 (3.4)] (Table 1). All subjects had adequate vision and hearing to participate in all portions of the assessments and all indicated some familiarity with computer use and regular television viewing.

Assessment battery

Tests were selected to represent commonly used measures in the evaluation of individuals with known or suspected dementia and assess a range of cognitive abilities. Tests included the Mini Mental State Examination (Folstein et al., 1975), Hopkins Verbal Learning Test-Revised (HVLT-R; Brandt, 1991), Digit Span (forward & backward), Oral Trail Making Test (Ricker, 1996), Letter Fluency, Category Fluency, Boston Naming Test (15-item version; BNT-15; Mack, Freed, Williams, & Henderson, 1992; Kaplan, 1983), and Clock Drawing. Alternate forms of the MMSE (using different 3 word recall stimuli), HVLT-R, Digit Span, Letter Fluency, Category Fluency, and BNT-15 were counterbalanced between sessions. To record and score nonverbal test results like clock drawing, the participant was asked to hold up their form to the camera for quick scoring and later review of mailed materials.

Assessment Protocol

All participants were assessed via both teleneuropsychology and traditional in-person assessment. Test forms and order of testing modality were randomly assigned and counterbalanced across subjects. Both testing sessions were completed on the same day. Each test condition lasted approximately 40 minutes with a 20-minute break in between sessions.

Testing Set-up

The set up included a videoconference system with a video camera, microphone, and 26" color monitor in each room with a closed network connection. All participants, including those with dementia, were readily able to follow instructions given remotely by the examiner. Subjects were tested 1:1 without additional personnel in the room. Confidentiality was secured through the use of an intranet network. None of the test sessions were interrupted by technological dysfunction.

Survey

Following the completion of both test sessions, participants were asked to complete a brief survey regarding their satisfaction and preferences regarding testing. A five level Likert scale was used and participants were asked to respond to a series of statements about the testing modalities with "Strongly Agree/Agree/Neutral/Disagree/Strongly Disagree." Examples of those statements include: “Overall, I was satisfied with the videoconference testing session,” “The testing instructions during videoconference testing were easy to

understand," "I was not concerned about my privacy during videoconference testing," and "I felt comfortable with the videoconference equipment." Participants were also asked to indicate their preferred testing modality and reasons for their preference (Table 2).

Statistics

Responses were categorized on the Likert scale with "Strongly Agree" and "Agree" combined to reflect overall endorsement of the statement, and "Strongly Disagree" and "Disagree" combined to reflect general rejection. Responses of "Neutral" were unchanged. Results were obtained by completing frequency counts of responses. Due to small sample sizes, patients with Mild Cognitive Impairment and Alzheimer Disease were analyzed together as a Cognitively Impaired group. Point-biserial correlations were examined to compare test condition preference by age, education, MMSE Total, hours of computer used per week, and hours of television watched per week. Loglinear analysis was performed to compare preference by diagnostic group and gender.

Results

All subjects completed both test sessions without difficulty or need for additional support and all completed the satisfaction survey. Ninety-eight percent of the total sample expressed overall acceptability of videoconference-based assessment (2% were neutral). One hundred percent reported that testing instructions were easy to understand. None reported that they were concerned about their privacy. No respondents indicated any difficulty or dissatisfaction with seeing or hearing test stimuli, and no problems with equipment arose during the videoconference testing sessions. When examining results from subjects with cognitive impairment as a group (n = 19), 95% noted they were satisfied with videoconference assessment overall (5% were neutral), and 100% of non-impaired subjects endorsed adequate satisfaction with videoconference based testing.

When asked about their preference of testing modality, 60% of all respondents indicated no preference for testing format, 30% preferred in-person assessment, and 10% preferred videoconference assessment. Results from those with and without cognitive impairment were similar, with approximately 2/3 of each group reporting no preference or preferring videoconference-based testing. A higher percentage of subjects with cognitive impairment indicated they preferred to be tested by an examiner in the room, and none of those with cognitive impairment expressed a preference for videoconference-based testing (Figure 1). However, test condition preference was not significantly associated with presence of cognitive impairment or global level of cognitive function based on total MMSE score ($r = -0.11$, $p = 0.50$). Age ($r = -0.04$, $p = 0.84$), level of education ($r = 0.23$, $p = 0.17$), gender ($\chi^2 = 4.23$, $p = 0.12$), hours of computer work or television watched per week ($r = -0.05$, $p = 0.76$; $r = -0.07$, $p = 0.66$) were not significantly associated with test condition preference.

Feedback from subjects revealed specific advantages for each test modality (See Table 3).

In person, sixty-three percent of the entire sample of participants found that it was "easier to establish personal connection with examiner," 34% percent found that it was "easier to communicate with examiner," and 24% found it was "easier to manipulate test materials." In terms of videoconference-based testing, 15% of participants endorsed that they "felt less anxious/nervous," 7% reported that it was "easier to concentrate," and 29% endorsed that "videoconference made the test session more interesting and/or fun." When asked how far they would be willing to travel before choosing videoconference-based assessment over face-to-face testing, approximately half of the subjects indicated that they would prefer to drive no more than three hours to undergo face-to-face assessment. Thirty percent indicated

they would drive more than three hours to be seen in-person versus being seen via teleneuropsychology.

Discussion

Teleneuropsychology as assessed in the present investigation appears to be well accepted by consumers. Our results reflected 98% satisfaction, and roughly 2/3 of participants indicated no preference between traditional face-to-face testing and examination by teleneuropsychology. Furthermore, participants endorsed acceptability of videoconference-based assessment regardless of cognitive impairment. Overall, these quantitative findings are consistent with previous encouraging reports from subjects in both teleneuropsychology and telemental health studies. Importantly, in addition to providing evidence of acceptability, these findings extend results to individuals who are cognitively impaired. Though individuals with cognitive impairment did not endorse a preference for teleneuropsychology, the majority indicated its acceptability. These findings represent some of the first published teleneuropsychology acceptability data and have implications for application and utility of teleneuropsychology in clinical populations.

There are several limitations to this study. First, the sample was relatively small, although the results were supportive of our hypothesis of good acceptability of videoconference based neuropsychological testing. Second, results may be limited to older populations, although in general, older individuals are less likely to be amenable to newer technologies than younger counterparts (Morris, Goodman, & Brading, 2007; Zimmer & Chappell, 1999). In addition, individuals with severe vision and hearing impairment were excluded. Given the potential challenges associated with examining subjects with significant sensory limitations in this fashion, acceptability as well as validity of data among such individuals may be impacted. Third, because we utilized a brief neuropsychological assessment that required 40 minutes on average (per test condition), our findings may be restricted to brief testing. Finally, subjects were generally familiar with computers and similar technologies and were recruited from an urban sample, which may limit the generalizability of findings to less technologically proficient or rural patients.

Further investigation is necessary in larger groups with greater diagnostic and functional heterogeneity to ensure generalizability. Moreover, though the testing set-up utilized for this study did not experience any technological failures, this may be more likely with more remote connections and/or with less sophisticated technological tools or naive users. Thus, future studies should examine such parameters in rural populations. In addition, future research should investigate acceptability in healthy controls as well as those with cognitive impairment when completing more comprehensive neuropsychological evaluations, as the use of additional test stimuli (some of which may require testing modifications), manipulatives, altered testing procedures, longer timeframe, etc., may influence consumer satisfaction.

Despite these limitations, our results were promising for the use of teleneuropsychology, which is consistent with previous reports from other telemental health services. We found that approximately 70% of individuals with or without cognitive impairment indicated a willingness to undergo this type of evaluation using videoconference technology. As teleneuropsychology emerges as a more commonly available tool, it could have a significant impact on the ability to bring specialty services to a greater number of patients. In conjunction with the preliminary data on reliability and validity from this growing literature, these results support teleneuropsychology as a viable and acceptable method for the remote assessment of cognitive functioning. The high level of acceptability we found shows promise for the implementation and utilization of this cognitive assessment medium in

clinical and research settings. In addition to the recent approval for reimbursement by Medicare, patient acceptability of this technology suggests that teleneuropsychology will likely assist in overcoming barriers of time and distance in the evaluation of cognitive impairment, which will ultimately benefit patients, clinicians, and researchers.

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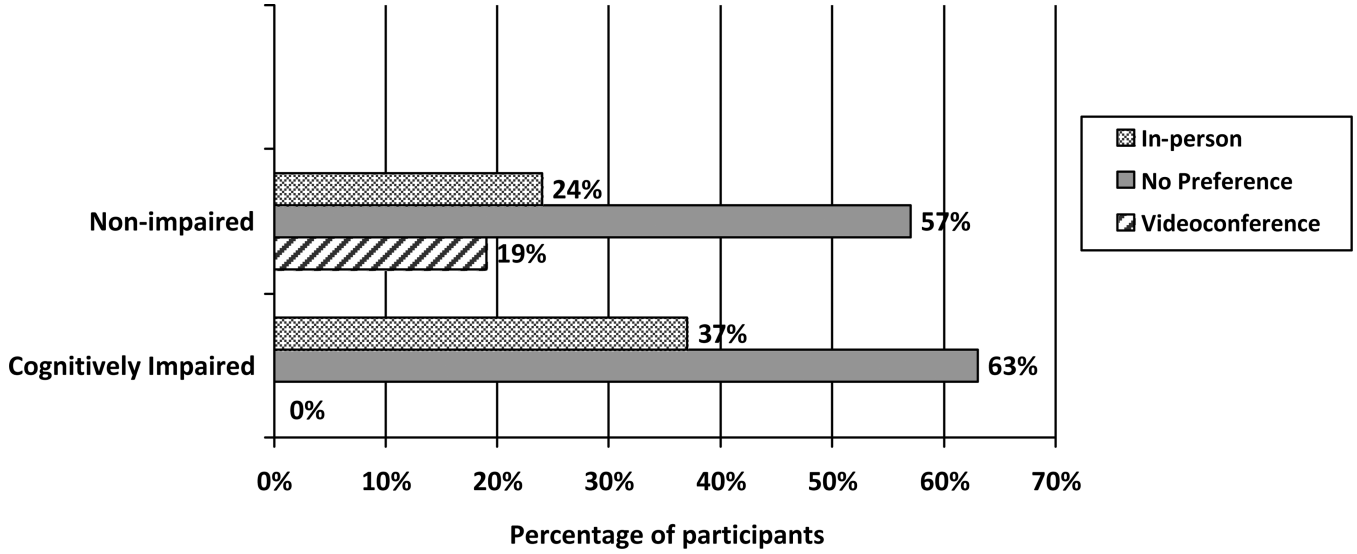

Figure 1.
Testing modality preferences of non-impaired and cognitively impaired subjects

Table 1

Participant characteristics [mean (SD)]

Group	Age	Years of Education	% Female	MMSE Total	Hours of computer use per week	Hours of television per week
Non-Impaired (n = 21)	66.6 (9.0)	14.5 (2.7)	75%	29.0 (0.9)	17.6 (15.4)	18.6 (12.1)
Cognitively Impaired (n = 19)	73.9 (8.5)	15.9 (2.7)	39%	26.8 (2.4)	12.4 (12.8)	26.5 (17.9)

Table 2

Survey Questions

1. Overall, I was satisfied with the videoconference testing session.
2. Which testing condition did you like better?: (*circle one*) ___ In-person assessment ___ No Preference ___ Videoconference assessment
3. I felt comfortable with the videoconference equipment.
4. The testing instructions during videoconference testing were easy to understand.
5. I was not concerned about my privacy during videoconference testing.
6. My comfort with the examiner was generally the same during the videoconference session as it was in person.
7. I would recommend videoconference-based cognitive testing to others.
8. What did you like about in-person assessment: (*please check all that apply*) ___ Easier to establish a personal connection with the examiner ___ Easier to communicate when in same room with examiner ___ Easier to manipulate test materials ___ Videoconference equipment had poor sound quality ___ Videoconference equipment had poor visual quality
9. What did you like about videoconference-based assessment: (*please check all that apply*) ___ Felt less anxious/nervous without examiner in the room ___ Easier to communicate with the examiner by videoconference ___ Easier to concentrate without examiner in the room ___ Videoconference equipment made the session more interesting and/or fun
10. If you needed to see a doctor for this type of testing, how far would you be willing to drive/ride before choosing videoconference-based assessment? *Please mark only one answer.* ___ Less than 1 hour ___ 1–3 hours ___ 3–6 hours ___ I would drive/ride as far as it takes and spend the night, if needed ___ I would prefer videoconference-based testing

Table 3

Test modality preferences (total sample)

Survey Question 8. What did you like about in-person assessment:	Easier to establish a personal connection with the examiner	Easier to communicate when in same room with examiner	Easier to manipulate test materials	Videoconference equipment had poor sound quality	Videoconference equipment had poor visual quality
% Endorsement	63%	34%	24%	0%	0%
Survey Question 9. What did you like about videoconference-based assessment:	Felt less anxious/nervous without examiner in the room	Easier to communicate with the examiner by videoconference	Easier to concentrate without examiner in the room	Videoconference equipment made the session more interesting and/or fun	
% Endorsement	15%	7%	7%	29%	