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Telepsychiatry for Neurocognitive Testing in Older Rural Latino Adults

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Abstract

As the population of older Latinos in the U.S. increases, availability of culturally-adapted geriatric psychiatry services is becoming a growing concern. This issue is exacerbated for rural Latino populations. In this study, we assessed whether neurocognitive assessment via telepsychiatry (TP) using a Spanish-language battery would be comparable to in-person (IP) testing using the same battery in a sample of Spanish-speaking older adults in a rural setting. Patients (N=22) received IP and TP testing 2 weeks apart. The order of IP and TP test administrations in individual subjects was determined randomly. Comparison of scores indicated that there were no significant differences between IP and TP test performance though both groups scored non-significantly higher at the second visit. This study demonstrates feasibility and utility of neurocognitive testing in Spanish using TP among older rural Latinos.

Keywords

Latino; telemedicine; telepsychiatry; cognition; neurocognitive testing; rural

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Introduction

Currently an estimated 5.3 million Americans have Alzheimer's disease (AD). It is predicted that the prevalence of dementias among U.S. Latinos will increase six-fold by 2050 as this segment of the population ages (1). At the same time, there is a serious lack of availability of culturally and linguistically appropriate healthcare services, such as neurocognitive testing for Latinos with dementia. In one study, up to 40% of foreign-born older Latinos were found to have undiagnosed dementia for at least 3 years (2). Because rural dwelling Latinos are a rapidly growing sub population, and yet have some of the poorest access to, and utilization of healthcare services, culturally-acceptable and easily administered interventions designed for this specific population hold potential to have a wide impact(3).

Neurocognitive testing is helpful in early detection and differential diagnosis of dementia. Neurocognitive tests developed in English are increasingly being translated into other languages (many into Spanish) and studied in adapted versions to ensure cultural and linguistic validity (4). However, these adapted neurocognitive tests may be unavailable to help clinicians caring for Latinos, especially in rural areas, because of shortage of trained neuropsychologists in these areas.

Telemedicine offers a partial solution to some of these disparities in access to care (5-7) by improving access to quality care, reducing costs due to travel, fuel consumption, and lost productivity. Telemedicine and related health information technologies have been identified by the Institute of Medicine as central tools in improving access and quality of healthcare for older patients, minorities (e.g., Latinos), and those living in rural communities across the U.S. (8). While feasibility of neuropsychological testing using telemedicine has ben demonstrated, it is unclear how this compares with in-person testing (9). The feasibility and utility of telepsychiatry (TP) for comprehensive neurocognitive testing among rural-dwelling Latinos have not been demonstrated previously. In this study, we aimed to compare in-person (IP) and TP-based neurocognitive testing approaches for Spanish-speaking rural patients, to assess feasibility and potential utility by examining correlations between scores on tests administered employing IP and TP approaches.

Methods

Participants

We recruited bilingual or monolingual Spanish-speaking individuals whose primary treating psychiatrists recommended testing for suspected cognitive impairment. All the subjects were over the age of 65 years. We excluded patients with severe concurrent medical illness, major psychiatric disorder, sensory impairments or previous neurological impairments (e.g. stroke). The protocol was approved by the University of California, San Diego (UCSD) Human Subjects Research Protection committee, and all the participants provided a written informed consent, after we established capacity to provide consent using the UCSD Brief Assessment of Capacity to Consent (UBACC). We randomized a total of 27 patients, 22 of whom completed both the required study visits as per protocol. Two participants were excluded because of medical complications developed between sessions, and three participants were determined to be too impaired cognitively to be able to complete testing.

The study participants and their treating psychiatrists (BN and AC) were located in Imperial County, CA. This rural county has a total population of 175,000, of whom 85% are Latinos, 25% meet federal poverty definition, and 23% are unemployed. (10).

Measures

All the subjects were assessed with the published/validated Spanish-language versions of the following tests: The Mini-Mental State Examination (MMSE) (11), Hopkins Verbal Learning Test (HVLT) – Revised (12), Digit Span subtest from the Escala de Inteligencia de Wechsler para Adultos—Tercera Edicion (EIWA-III) (13), Letter and Category Fluency (14), Clock Drawing (15), Brief Visuospatial Memory Test (revised) (BVMT-R) and Ponton-Satz Spanish Naming Test (16). Prior studies have demonstrated strong/established psychometric properties for the Spanish language versions all tests in our battery (12;16). Our battery measured cognitive constructs known to be sensitive to, and commonly assessed in, the differential diagnosis of dementia. In addition, viability of administering English-language versions of these measures over a teleconferencing format has been established (17;18). Total testing time was approximately 45 minutes. Two clinical evaluators were trained by a senior neuropsychologist (BP) to administer and score these tests (in both IP and TP modalities), and adequate intra- and inter-rater reliability was established. We calculated standardized z-scores for each subject against population norms for the following cognitive tests: MMSE, BVMTR, HVLT, Digit Span Forward, and Digit Span Backward. The mean z-score for these tests was computed as an indicator of cognitive functioning. We also calculated a composite z-score as an indicator of overall cognitive functioning.

Telemedicine network and equipment—We used a commercial DSL connection with 512 kbps bandwidth, required for telemedicine (15;18). TP patient equipment was comprised a CODEC (coder-decoder) capable of simultaneously streaming video and content (i.e., laptop screen) on side by side monitors, remotely controlled Pan Tilt and Zoom cameras, a tablet PC laptop, videoconference microphone; and dual 26 inch LCD TVs.

Telepsychiatry testing procedure—For TP testing, participants were seated in an examination room set up for TP and were accompanied by a Mexican-American research associate (RA) fluent in Spanish and English. The RA oriented the patient to the TP equipment and videoconference procedures, and then initiated the TP call to connect with the clinical evaluator located at UCSD. The clinical evaluator was able to guide the patient and provide instructions on each of the neurocognitive tests, just as if he/she were present in the room. During the actual neurocognitive testing, the RA was not present in the room, but remained available to help with any unforeseen technical or clinical issues.

In-person testing process—For IP neurocognitive testing, patients met with the clinical evaluator in an exam room at Sun Valley Behavioral Medical Center (SVBMC) in El Centro, CA. Testing sessions were conducted two weeks apart, and participants were randomly assigned to receiving TP at the first versus second session. Participants were tested by different raters at both sessions.

Other Measures—In addition to neurocognitive testing, all participants were assessed for depressive symptoms (using the Center for Epidemiological Studies scale for Depression (CES-D)) (19), health literacy (using Short Assessment of Health Literacy for Spanish Adults -50 (SAHLSA-50)) (20) and acculturation (using Acculturation Rating Scale for Mexican Americans II (ARMSA II)) (21). The telemedicine equipment used end-to-end encryption to ensure privacy and security.

Statistical Analyses

We divided our sample into two groups – the first consisted of persons who received TP in the first session, while the second group was comprised of individuals who received IP testing in the first session. We calculated correlations between IP and TP test results irrespective of the order of administration. We then used mixed-effects regression to examine the fixed effects of time (first testing session vs. second testing session), group (TP first vs. IP first) and the interaction of time and group. Evidence for a significant interaction term would be interpreted as evidence that ordering effects were present. We then examined each of the individual neurocognitive tests as dependent variables. We calculated the discrepancy between IP and TP visits for each person and then examined whether this value was associated with any of the demographic or clinical variables with Pearson correlations. The alpha-level was set at 0.05. Based on power analysis tables, our power to detect a moderate effect size difference in a dependent samples (group sizes of 11) with two levels was 0.55.

Results

In terms of demographic or clinical characteristics, we did not observe any significant differences between the IP and TP groups (Table 1). Both groups were comprised primarily of men, with a high degree of self-identified Mexican identity on the ARMSAII and low degree of education. The sample was representative of the sociodemographic profile of Imperial County. The results indicated a sample mean z-score of -1.59 suggesting mild to moderate cognitive impairment in the sample.

The composite z-scores at baseline and week 2 were strongly correlated in both TP and IP groups ($r = 0.870$, $df=10$, $p<0.001$). For both groups, higher composite z-scores were significantly correlated with health literacy * (SAHLSA-50; $r = 0.59$, $df=10$, $p=0.006$ for IP; $r = 0.43$, $df=10$, $p=0.05$ for TP), and negatively correlated with age ($r = -.51$, $p=0.02$ for IP; $r = -0.50$, $df=10$, $p=0.02$ for TP). In the TP group, higher cognitive scores were associated with higher level of education ($r = 0.56$, $df=10$, $p=0.009$), but this association was not significant in the IP group ($r = 0.36$, $df=10$, $p=0.115$)

Using mixed-effect models, time 1 and time 2 scores were not statistically different ($F(1,37)=1.2$, $p=0.280$). Mean change in z-score was 0.149 for IP-first and 0.120 for TM-first. There was no effect of group ($F(1,37)=0.31$, $p=0.579$) and there was no visit by group interaction ($F(1,37)=1.95$, $p=0.662$). The mean difference at baseline between TP and IP groups was 0.24 (95% CI: -0.47 to 0.96) and the effect sizes for this difference was Cohen's $d = 0.31$ (95% CI: 0.01 to 0.65). At follow up, the mean difference was 0.03 (95% CI: -0.70 to 0.76) and the effect size for this difference was Cohen's $d = 0.04$ (95% CI: -0.03 to 0.36).

We also compared scores on each of the individual cognitive tests in the battery, and did not find any differences between IP and TP groups, or any significant differences between visits.

Discussion

Our study demonstrated no significant differences between cognitive scores, depending on the testing modality. While we noted that scores at the second visit were higher than at baseline for both groups, this difference did not achieve statistical significance. To our knowledge, this is the first study to directly compare TP and IP neurocognitive testing in Spanish in an older rural Latino sample. Our study confirms findings from other studies that have suggested acceptability of telemedicine-based clinical services among Latinos (4;22) . While it has been suggested that cognitive screening using telemedicine may be feasible, (23), previous studies have not conducted direct comparisons within subjects. While one recent pilot study compared telemedicine and face-to-face testing (24) and demonstrated that these were comparable, our study looked at interactions over two testing sessions, and included within-subject comparisons. Our study also adds to the growing evidence of applicability of telemedicine-based services for psychiatric care in rural areas (25;26).

It is possible that clinically significant effects may not have been identified in our study because of a small sample and large confidence intervals. Studies with bigger sample sizes should focus on this issue, to determine whether a study with greater power to pick up more subtle effects replicates this absence of significant difference. The strengths of the study included a comprehensive battery of standardized Spanish language neurocognitive tests, and a rigorously controlled testing situation. Limitations include small sample size, which might lead to a Type II error – i.e., not finding significant differences that could be demonstrated in larger samples. However, the mean differences in scores between visits were small, and the standard deviation of the differences in these z-scores were <0.5 (Std deviation = 0.3 for both IP and TP groups). A standard deviation difference of greater than 0.5 is associated with clinical significance in neuropsychological testing (27). Additional limitations are that given the low level of education and acculturation in our sample, it is unclear if these findings may be generalizable to higher educated samples, particularly those more acculturated to mainstream U.S. culture.

Despite the above limitations our study provides preliminary evidence for feasibility and utility of neurocognitive testing using TP among older rural Latinos. This has clinical significance, as it supports clinical use of telepsychiatry for neurocognitive testing in Latino populations. In this manner, this approach could promote more reliable diagnosis of cognitive disorder in this population, especially those dwelling in rural areas with poor access to care. Future studies on this topic should include larger samples, and should focus on subjective assessment of acceptability of telepsychiatry for neurocognitive testing. Future studies should additionally examine the potential moderating effect of education and acculturation on telemedicine. Studies on cost-effectiveness of this technology will also be required to determine feasibility of dissemination of this approach.

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Table 1

Comparison of In-Person First and Telepsychiatry First Groups

Variable	In-person first group (N=11)	Telepsychiatry first group (N=11)
% Men	81.8%	72.7%
Mean Age in Years (Std. dev))	70.1 (8.7)	71.4 (10.6)
Education in Years (Std. dev))	5.0 (3.7)	5.9 (4.8)
Currently Married	36%	54%
Living Alone	27.3%	27.3%
Acculturation (ARMSA-II)		
Very Mexican Oriented	81.8%	72.7%
Balanced Bicultural	9.1%	18.2%
Slightly Anglo-oriented bicultural	9.1%	9.1%
Health Literacy (SAHLSA-50) Mean (Std Dev)	40.7 (9.5)	44.1 (3.7)
Depression (CES-D)	30.6 (13.2)	21.4 (14.6)
Mini Mental State Exam (MMSE) Mean z-score (Std Dev, Median)	−1.02, (3.03, −0.45)	−0.73 (3.18, 0)
Brief Visuospatial Memory Test – Revised (BVMT-R) Mean z-score (Std Dev, Median)	−1.59 (0.84, −1.73)	−1.66 (0.90, −1.80)
Hopkins Verbal Learning Test (HVLT) Mean z-score (Std Dev, Median)	−1.77 (1.60, −1.67)	−2.54 (1.12, −2.37)
Digits Forward Mean z-score (Std Dev, Median)	−1.40 (0.52, −1.33)	−1.21 (0.56, −1.33)
Digits Backward Mean z-score (Std Dev, Median)	−0.50 (0.76, −0.67)	−0.73 (0.57, −0.67)
Cognitive Composite Mean z-score (Std Dev, Median)	−1.14 (0.91, −1.09)	−1.36 (0.93, −1.15)

ARMSA – Acculturation Rating Scale for Mexican Americans

SAHLSA – Short Assessment of Health Literacy for Spanish Adults

CES-D – Center for Epidemiological Studies Scale for Depression

Note: Differences between the groups were calculated using chi-square (for categorical) and T-tests (for continuous) and did not achieve statistical significance ($p<0.05$) for any of the variables. All chi-square tests had a df of 1 and t-tests had a df of 20