Teleneuropsychology (TeleNP) in Response to COVID-19: Practical Guidelines to Balancing Validity Concerns with Clinical Need

Rene Stolwyk, DPsych(Clin.Neuro), PsyBA
Senior Lecturer and Clinical Neuropsychologist
Turner Institute for Brain and Mental Health
Monash University, Melbourne, Australia
Email: rene.stolwyk@monash.edu
Twitter: @rene_stolwyk

Dustin B. Hammers, Ph.D., ABPP(CN)
Board Certified in Clinical Neuropsychology
Associate Professor, Department of Neurology
University of Utah, Salt Lake City, Utah
Email: dustin.hammers@hsc.utah.edu

Lana Harder, PhD, ABPP
Board Certified in Clinical Neuropsychology
Board Certified Subspecialist in Pediatric Neuropsychology
Children’s Medical Center Dallas
Associate Professor of Psychiatry and Neurology
University of Texas Southwestern Medical Center
Email: lana.harder@childrens.com

C. Munro Cullum, Ph.D., ABPP-CN
Professor of Psychiatry, Neurology, and Neurosurgery
Pam Blumenthal Distinguished Professor of Clinical Psychology
Senior Neuropsychologist, O’Donnell Brain Institute
University of Texas Southwestern Medical Center
Email: munro.cullum@utsouthwestern.edu

INS Webinar Presented on 4/2/2020
Objectives

Following this webinar, attendees will be able to:

• Understand the evidence base supporting TeleNP procedures as well as the strengths and limitations of different models

• Apply knowledge of models of TeleNP and evaluate potential feasibility within your own clinical settings

• Understand key legal and ethical considerations when providing TeleNP services
Outline

• Ethical and Legal Challenges
• Logistical and Practical Considerations
• Models of TeleNP
• Evidence for use of Specific Measures over TeleNP and Patient Satisfaction
• Practical Considerations for Home-Based TeleNP
Our Experience with TeleNP

• Dr. Hammers leads the University of Utah TeleNP Program
  • Joint relationship between University of Utah Cognitive Disorders Clinic and St. John’s Institute of Cognitive Health in Jackson, WY
  • >400 patients seen since 10/2009

• Dr. Stolwyk leads the Monash TeleNP Service
  • Running since 2016
  • Delivering Tele-Neuropsychology assessment and rehabilitation services across four hospitals in rural Victoria, from a Melbourne metropolitan hub
  • Includes secondary consultation and primary patient assessments
  • Research program includes validating telehealth administration of neuropsychological assessment tasks in stroke populations
Our Experience with TeleNP

• Dr. Harder has conducted the only known study evaluating a neuropsychological assessment battery via home-based TeleNP in children and adolescents.

• Dr. Cullum has conducted the largest TeleNP study to date, along with a series of related TeleNP projects that have demonstrated the feasibility, reliability, validity, and acceptability of TeleNP procedures in older adults with and without cognitive disorders and in underserved populations.
A Pressing Need

• In response to the Coronavirus (COVID-19) outbreak, there is a need for neuropsychology to apply tele-communication technologies to assist patients in novel ways.

• Potential limitations on in-person direct cognitive testing:
  • Hospital and institutional restrictions on in-person visits
  • Private practice providers attempts to reduce the COVID-19 exposure possibility for their patients
  • Patient cancellations and understandable avoidance of appointments at the current time
Striking a Balance

• Validity concerns vs. practical needs when using tele-communication strategies in the times of COVID-19

• Even during these unprecedented times, APA Ethics Codes, APA Tele-psychology Guidelines, and respective state copyright laws still apply

• Check your national Ethics Codes and Guidelines, and IOPC’s Provisional Recommendations – Guidance for Teleneuropsychology-COVID-19 ([https://iopc.squarespace.com/teleneuropsychology](https://iopc.squarespace.com/teleneuropsychology)).

• Most important to consider:
  • **What service is in the best interest of the patient?**
  • Immediate clinical necessity during COVID-19 outbreak vs. modified evaluation
What is TeleNP?

• Telepsychology is defined as the provision of psychological services using telecommunication technologies.

• Examples: telephone, mobile devices, interactive videoconferencing, email, chat, text, and Internet (e.g., self-help websites, online psychoeducational materials or bulletin boards, blogs, and social media).

• Different technologies may be used in various combinations and for different purposes during the provision of telepsychology services.

• NOTE: While several telephone screenings measures exist, such as TICS/mTICS, COGTEL, or T-MOCA (among MANY others), we will be focusing this talk on remote video conferencing.

https://www.apa.org/practice/guidelines/telepsychology
Ethical and Legal Challenges for TeleNP
Ethical Balance:

• **Principle A: Beneficence and Nonmaleficence**
  • Psychologists strive to benefit those with whom they work and take care to do no harm

Vs.

• **Principle D: Justice**
  • Psychologists recognize that fairness and justice entitle all persons to access to and benefit from the contributions of psychology and to equal quality in the processes, procedures, and services being conducted by psychologists.
Direct-To-Home TeleNP

• **Pros:** Access to care during COVID-19, patient convenience, accommodating patient special needs

Vs.

• **Cons:** Information security, emergency management, alterations to service delivery (testing session), less ability to “control” the session/interview, potential threats to validity
Direct-To-Home TeleNP

• Services Ideal for:
  • History
  • Feedback
  • Interventions

• Limited direct-to-home cognitive testing:
  • Verbal cognitive tests
  • Tests without manipulated stimuli
Informed consent must specifically address the unique concerns related to TeleNP services.
Legal Aspects

• It is essential to know not only which relevant laws are applicable, but also from what state are the laws applicable
  • Laws and regulations are based on where the patient is located
  • This includes the neuropsychologist being licensed in that particular state

• Relevant laws may include:
  • Duty to Warn
  • Duty to Report
  • Record Keeping
  • Patient Confidentiality/Access to Records
  • Red Flag Laws (DE, FL and MD)

• Remember, if conducting tele- services out of state, and laws conflict between the neuropsychologist’s and patient’s states, the patient’s state overrules
Competency

• While neuropsychologists have directed years of training and practice to develop and maintain their competence related to neuropsychological practice and theory:
  • How many psychologists are well-learned in tele-communication issues?
  • Do they know the resources available for the areas in which your patients are located?

• This COVID-19 pandemic is creating a unique opportunity for trainees and practitioners in applied TeleNP, TelePsychology, and TeleHealth
A Quick Word About Billing

● We will be providing limited information regarding billing practices
  ○ Each state/region is unique, as are hospital billing practices
  ○ We encourage you to review the following for the latest updates
    ■ iopc.online
    ■ CMS.gov
  ○ We encourage you to also speak to your state/provincial/territorial association for information specific to your needs
State telehealth coverage mandates for private insurance

Private insurance coverage mandate legislation enacted
No coverage mandate

Slide courtesy of Deborah C. Baker, J.D.
Director of Legal and Regulatory Policy, APA
**State PSYPACT legislation efforts**

*IMPORTANT NOTE: PSYPACT has become operational as seven states have officially enacted PSYPACT legislation. Next, the PSYPACT Commission will be established and they will be responsible for the creation of Bylaws and Rules. Once those are finalized, the application process will open for the E.Passport and Interjurisdictional Practice Certificate (IPC).*
Logistical and Practical Considerations
General Service Requirements and On-Site Logistics

Requirements

• Computer with consistent bandwidth for both locations
• Camera - at least one*
• Private Room
• Neuropsych testing materials

Logistical Steps and Concerns

• Contract between hospital systems or insurance pre-authorization
• Telehealth consent for patient
• Review results with patient/send other providers the report
• Billing
Comparing Tele-Health Platforms


Ratings Based On: Privacy/Security, Available Features, Ease of Use, Functionality, Customer Support, Value For Money
Important Features of any platform:

- Creation of encrypted “virtual room”
- Optimal video quality, even for low-bandwidth locations
- Advanced integrations into EHR systems including Epic, Allscripts, and Cerner
- HIPAA-compliant business associate agreement (BAA): BAA indemnifies the psychologist or practice if they cause a HIPAA breach
TeleNP Essential Issues to Consider

• Cognitive Severity or Developmental Level
  • Is the provision of TeleNP services appropriate and beneficial
  • Challenging for certain ages, neurodegenerative conditions, or developmental delays

• Psychiatric or Behavioral Severity and Stability
  • Given the modified interaction style of the tele-communication medium, are patients too emotionally labile or unstable?
  • Is a child too young or behaviorally dysregulated?
  • Well-articulated referral notes and pre-session history questionnaires advised

• Therapeutic Needs
  • Consider limitations of providing emotionally-challenging information over a medium with reduced rapport
  • Alternatives to tele-feedback, or assurance of a “safety net” after feedback
• Other factors to consider:
  • Connectivity issues
  • Language barriers or comprehension issues (hearing loss, aphasia)
  • Technological competence (both psychologist and patient)
  • Medical conditions (epilepsy)

• In the ideal world, consider some initial in-person contact with the patient to facilitate an active discussion on these issues and/or conduct the initial assessment.
Issues that may arise with test instruments and approaches designed for in-person implementation

• **Psychometric Validity**: Are the psychometric properties of the tests and assessments (e.g., reliability and validity) preserved when adapted for use with such technologies?

• **Standardization Issues**: Are the conditions of the testing preserved as suggested in the test manual?
  • Secure room, free of distractions from family or medical support staff?
Further Validity and Test Security Issues

• **Construct Validity**: Are patients receiving assistance with test instructions in a non-standardized manner, or could family (or nursing staff) unintentionally be influencing answers?

• **Distraction Issues**: Because neuropsychologists are not in the room, could other sensory issues be present in the room that could affect performance during an assessment that may not be obvious or visible (e.g., sight, sound, smell, or temperature)?

• **Test Security**: If the patient became in possession of test materials or stimuli regardless of the testing medium, this would represent both an ethical and legal violation.
TeleNP Norms and Write-up

• Important to use test norms derived from telecommunication technologies administration if such are available
  • If not available, okay to use pre-existing norms but apply conservative interpretation

• Document use of tele-neuropsychology, what norms used, and describe any accommodations or modifications that have been made

• Recognize the potential limitations of all assessment processes conducted via telepsychology, and be ready to address the limitations and potential impact of those procedures versus results obtained in-person
Recent Changes in Test Publisher Guidelines

- Before test administration, the qualified professional must obtain documented agreement from the examinee that the session will not be recorded, reproduced or published, and that copies of the materials will not be made. Further, the qualified professional may not utilize recording capabilities to record live test administrations.

- This permission is intended to include the use of non-public facing screen-mirroring and screen share methods to remotely share test item content with examinees on a computer screen and capture responses either verbally or through other means.

- This permission is not intended to allow for use of photocopying, scanning, or duplication of test protocols, including any screen capture or session recording technology, but is merely intended to support practical live delivery of tele-health services.

- This permission is also not intended to allow for any modification to the original test content as it currently appears.
What this means in practice:

• In coming days Pearson will release electronic version of stimulus books via Q-Global platform
  • Clinicians may screen share/mirror with the patient screen these digital stimulus books purchased on Q-interactive

• For traditional stimuli, clinicians may 1) use a document camera or 2) display the stimuli in front of the camera to screen-share stimulus materials

• It is still a copyright violation and breach of test security to scan/photocopy stimulus materials, or to mail out test materials or forms
Technical Issues:

• Even if tele-communication is secure, is the patient confident of that?
• Does the patient know (or think) that the session is being recorded?
• Increased risk of intrusions to confidentiality and patient security given back-and-forth between sites

• TeleNP most appropriate when using a trained on-site assistant to:
  • help verify the identity of the patient
  • provide needed on-site support to administer certain tests or subtests
  • protect the security of the psychological testing and/or assessment process
Additional Considerations

• Consistent, fast audiovisual connection
  • Audio clarity, consistency, loudness essential

• Clear view of subject / examiner
  • Adequate monitor size, resolution, recovery rate
  • Responses, writing/motor behavior, attitude
  • Useful for examiner to view subject and self
  • Camera mobility useful
  • Where do I look / how do I look?
  • How many cameras do you need?
• Enhancing subject comfort with testing environment and ability to understand & carry out instructions, manipulate test materials, & assist examiner

• What materials are needed at remote site?
  • How will clients access materials?
  • What will be shown to them vs. local manipulatives?
TeleNP Models
TeleNP Models

Trained Technician “Tele-Interview” Model

- **Pros:**
  - Comparable battery to local
  - Assess wide range of severity

- **Cons:**
  - Trained tech at every site
  - Patient must be within drive of remote site
  - In-person testing may be restricted because of COVID-19

= Home Site
= Remote Site w/ NΨ Tech
Assistant Proctored “Full- TeleNP” Model

- Pros:
  - Services provided to many sites
  - No need for on-site technician
  - Minimal travel for patients

- Cons:
  - Stable internet connection required
  - Licensure issues
  - In-person testing may be restricted because of COVID-19

= Home Site
= Remote Sites w/ Assistants
In-Clinic Hybrid “TeleNP” Model

• Pros:
  • Clinician and patient in adjacent rooms, or at least at spatial distance
  • Ideal for when clinics transition to or from “lock down”
  • Stronger test security, better able to “control”

• Cons:
  • Patient must be more cognitively able
  • Still requires patients and providers to come to clinic

= Home Site
= Remote Clinical Sites
Direct - to - Home “Full- TeleNP” Model

- Pros:
  - Services provided directly to home
  - No assistant training or patient travel

- Cons:
  - More limited battery for testing
  - Validity/Security concerns
  - Limited guidance if confusion present
  - Connection and licensure issues
Assistant Proctored “Full TeleNP” Model

<table>
<thead>
<tr>
<th>Location</th>
<th>Clinician and Client in separate clinics/hospitals. E.g. Monash Psychology Clinic to Echuca Regional Health</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trained Assistant Required?</td>
<td>Yes</td>
</tr>
<tr>
<td>Restrictions to Test Selections</td>
<td>Minimal</td>
</tr>
<tr>
<td>Cognitive/Sensory/Motor requirements of Client</td>
<td>Minimal</td>
</tr>
<tr>
<td>Travel Requirements</td>
<td>None</td>
</tr>
<tr>
<td>Meeting Social Distancing Requirements?</td>
<td>No</td>
</tr>
</tbody>
</table>

Monash TeleNeuropsychology Service has been running since 2016. Most research has used this model...
Secondary Consultation

- Team and Family meetings
  - Identifying referrals and opportunities for rehabilitation
  - Discharge planning and decision making capacity issues
- Guiding team on how to managing neuropsychological impairments
  - Collaborative SMART goal setting for cognition and behaviour
- Behaviour Management
  - Development behaviour management plans
  - Avoiding over-sedation and chemical restraint
TeleNP Assessment

- Relatively brief (90 mins approx.)
- Focus on neuropsychological strengths and weaknesses to guide rehabilitation
- Occasionally conducted for diagnostic opinion or decision making capacity issues

### Pre-Assessment
- Pre-briefing patient
- Document verbal consent for telehealth
- Transferring patient information to secure server

### Assessment
- Room set up
- Procedures for tech difficulties
- Assistance during assessment
- Interview
- Formal assessment

### Post-Assessment
- Debriefing patient
- Reports and recommendations to team
- Feedback and psychoeducation to patient and family
Set Up

- Zoom videoconferencing software, existing PC and tablet hardware
  - Screen sharing
  - Multiple cameras for assessment
  - Session recording
- Virtual Private Networks to share documents
- Web-based encrypted email
- Private rooms on both ends
- Trained assistants available
Client Pre-briefing

Dr Upeka Embuldeniya and Ms Kate French

Tele-Neuropsychology in Stroke Rehabilitation

Patient Appointment Information

Why have I been referred for Neuropsychology?
- You have had a stroke
- Your Rehab team have referred you to Neuropsychology to help you understand any changes to your thinking, memory, and coping after your stroke.
- Our Neuropsychologist is Upeka

What do Neuropsychologists do?
- A Neuropsychologist focuses on understanding the relationship between the brain and behaviour.
- After having a stroke, it is common for people to have changes with how they think, their memory, mood and behaviour.
- Upeka, our Neuropsychologist, is able to assess these changes and provide recommendations to assist with your rehabilitation.

What is Telehealth?
- Telehealth is providing healthcare using technology (via a computer)
- Upeka, our neuropsychologist, is located in Melbourne
- She completes her sessions on Tuesdays via the computer

Who will be present during the appointment?
- Upeka will be present via the computer.
- There will also be another Rehab staff member to help if needed.

What do I need to bring to the appointment?
- Aids to assist with vision (e.g., glasses), hearing (e.g., hearing aids) and mobility.

How long will the appointment take?
- Each session will take approximately 1 hour
- You may be seen across multiple sessions.

What does the appointment involve?
Upeka will:
- Speak to you about how you have been going since the stroke, asking questions about;
  - Your thinking and memory
  - Your coping and mood
  - Your life before the stroke (e.g. what you did for work, who are your main supports)
- Do some tasks to assess your thinking and memory
  - You do not have to prepare for this
  - There will be both easy and hard tasks
Where will the appointment take place?
- The appointment will take place in the TeleNeuropsychology Project Room in Nicholson Rehabilitation ward.
- A staff member will come and collect you for your appointment.

What if I have any questions about my appointment?
- Please ask the team to contact Kate French
  - Kate is a Senior Occupational Therapist (OT) and the Key Contact Person.
  - Kate’s pager number is 32673
- Feel free to ask any member of the Rehab team and they can direct you to Kate or Upeka to help answer your questions
Setting up for session:
• Allow at least 15 minutes for set-up prior to the scheduled session time
• Prepare assessment tools, as directed by the Neuropsychologist
  • Gather required assessment forms and equipment from the storage cupboard
  • Provide 2 pens and some blank paper
  • Place all assessment resources into respective coloured folders
• Check that cameras are attached to the computer and working
  • 1 x camera facing patient when seated
  • 1 x camera facing table directly in front of patient
The environment:

- Clear the assessment area and remove any potential distractions
- Ensure enough space in front of computer for A4 piece of paper (in portrait orientation)
- Ensure tissues are available and within reach for the patient
- Room should be quiet and well-lit – consider closing curtains/blinds
- Not shared patient room or shared office
- Place ‘assessment in progress’ sign on door and close door
During session:
• Ask patient’s permission to stay for session
• Ensure seating is appropriate for patient – e.g. reaching desk to write
• Ensure patient has glasses/hearing aids
• Check sound and video quality (be aware that sound can become distorted/unclear if too loud and may be heard from corridor)
• Check camera switching function is working
• Stay for assessment or negotiate time to return to assist for a portion
When Assisting with Neuropsychological Assessments, Please:

- **DO** make sure you are familiar with the forms and tests in the test kit before the session starts.

- **DO** use blank paper for drawing or written tasks, rather than the flip side of test forms – always give to the Patient in portrait orientation.

- **DO** provide the Patient with pens that are dark/thick enough to be seen when scanned, rather than pencils.

- **DO** provide the RCF form to the Patient in portrait orientation.

  [Diagram]

  This way up

- **DO** take test forms away from the Patient as soon as the test is completed, placing them out of sight.

- **DO** scan all pieces of paper that the Patient has written on and send them to the Neuropsychologist immediately after the session.

- **DO NOT** repeat, rephrase or clarify task instructions or questions, unless instructed to do so by the Neuropsychologist.

- **DO NOT** photocopy copyrighted test booklets, such as the WAIS-IV Response Booklet 1 and WMS-IV Response Booklet 1 (plenty of original booklets have been provided).
Individual patient sessions:

- Ensure Neuropsychologist has number to call if assistance required
- Show patient how to switch cameras using keyboard (stickers should be placed on keys)
- Orient patient to the staff alert system and advise when to use
- Offer glass of water before leaving room
- Ensure patient is able to safely exit the room on completion of session (can be difficult if in wheelchair)
Training TeleNP Assistants (cont)

Following session:
- Provide patient with an opportunity for questions / feedback
- Upload all written documentation from the session to the shared folder for neuropsychologist to access
- Shred test forms when confirmed received by Neuropsychologist (do not place in medical file)
- Document in medical file that session has occurred (do not include content of session)
## Cognitive Assessment

<table>
<thead>
<tr>
<th>No Modification Required</th>
<th>Stimulus Materials and Forms in Coloured Folders</th>
<th>Assistant Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>• WAIS-IV Digit Span</td>
<td>• MoCA</td>
<td>• WAIS-IV Block Design</td>
</tr>
<tr>
<td>• WAIS – IV Similarities</td>
<td>• TOPF</td>
<td>• WMS-IV Visual Reproduction</td>
</tr>
<tr>
<td>• HVLT-R</td>
<td>• Stroop Test (Victoria Version)</td>
<td>• WAIS-IV Matrix Reasoning</td>
</tr>
<tr>
<td>• Semantic Fluency</td>
<td>• Oral SDMT</td>
<td>• RCFT</td>
</tr>
<tr>
<td>(Animals)</td>
<td>• WAIS-IV Vocabulary</td>
<td></td>
</tr>
<tr>
<td>• Letter Fluency (FAS)</td>
<td>• BNT-2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Trail Making Test</td>
<td></td>
</tr>
</tbody>
</table>

* Level of assistant input depends on client motor/sensory abilities, level of cognitive/behavioural function etc.
### In-Clinic Hybrid Model

<table>
<thead>
<tr>
<th>Location</th>
<th>Clinician and Client in adjacent rooms, or at least at social distance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trained Assistant Required?</td>
<td>No</td>
</tr>
<tr>
<td>Restrictions to Test Selections</td>
<td>Some</td>
</tr>
<tr>
<td>Cognitive/Sensory/Motor requirements of Client</td>
<td>Some</td>
</tr>
<tr>
<td>Travel Requirements</td>
<td>Both clinician and client need to travel</td>
</tr>
<tr>
<td>Meeting Social Distancing Requirements?</td>
<td>Yes</td>
</tr>
</tbody>
</table>
In-Clinic Hybrid Model – Clinical Considerations

- Pre-briefing via phone on procedures
- Follow clinic/hospital infection control measures
- Interview at social distance or via telehealth in adjacent room
- Assessment of verbal tests at social distance or via telehealth in adjacent room
- Assessment of test requiring stimulus materials and/or test forms
  - Use Q-interactive to present stimulus where possible
  - Use Q-global stimulus materials when available (or document camera in interim)
  - Use coloured folders for test forms etc
- Thorough disinfection of materials/forms post assessment
- De-brief via phone post assessment
## Clinic Cognitive Assessment

<table>
<thead>
<tr>
<th>No Modification Required</th>
<th>Screen Share Stimulus Materials</th>
<th>Forms in Coloured Folders Materials on hand</th>
<th>Not possible</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• WAIS-IV Digit Span</td>
<td>• Trail Making Test</td>
<td>❖ BNT-2</td>
</tr>
<tr>
<td></td>
<td>• WAIS – IV Similarities</td>
<td>• WAIS-IV Vocabulary</td>
<td>❖ Stroop Test (Victoria Version)</td>
</tr>
<tr>
<td></td>
<td>• HVLT-R</td>
<td>• WAIS-IV Matrix Reasoning</td>
<td>❖ RCFT</td>
</tr>
<tr>
<td></td>
<td>• Semantic Fluency (Animals)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Letter Fluency (FAS)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• TOPF</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• WAIS-IV Vocabulary</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• WAIS-IV Matrix Reasoning</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Trail Making Test</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• WAIS-IV Block Design</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• WMS-IV Visual Reproduction</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- ✔ New Online Admin of MoCA has been released [https://www.mocatest.org/remote-moca-testing/](https://www.mocatest.org/remote-moca-testing/)
- ❖ Not possible until publishers give permission for electronic stimulus presentation
- • Again, all the above depends on the cognitive behavioural status of your client
Within Clinic Test Administration
Q-interactive
Ethical Issues and Evidence Base

• Limited evidence to support presentation of stimulus materials up on screen as opposed to flat on table
  • May particularly impact subtests such as Block Design
## Direct-to-Home Full TeleNP Model

<table>
<thead>
<tr>
<th>Location</th>
<th>Clinician in clinic/home, Client at home</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trained Assistant Required?</td>
<td>No</td>
</tr>
<tr>
<td>Restrictions to Test Selections</td>
<td>Most</td>
</tr>
<tr>
<td>Cognitive/Sensory/Motor requirements of Client</td>
<td>Significant</td>
</tr>
<tr>
<td>Travel Requirements</td>
<td>None (assuming appropriate home office set up)</td>
</tr>
<tr>
<td>Meeting Social Distancing Requirements</td>
<td>Yes</td>
</tr>
</tbody>
</table>

The New Frontier !?
Direct- To- Home Full TeleNP Model – Clinical Considerations

• Pre-briefing via phone on procedures
• Ensure client has adequate set up at home
  • Adequate bandwidth
  • Able to access your telehealth platform
  • Determine/document screen size (preferably desktop, minimum tablet, not phone)
  • Quiet, secure, well lit room. Mobile phone on silent.
  • Explain no recording of session or screen capture
• Complete test run on a previous day
• Assessment of test requiring stimulus materials
  • Use Q-global stimulus materials when available (or document camera in the interim)
• Non-copyrighted forms within public domain sent back via pre-paid registered mail.
• De-brief via phone post assessment
### Home Cognitive Assessment

<table>
<thead>
<tr>
<th>No Modification Required</th>
<th>Screen Share Stimulus Materials</th>
<th>Stimulus Materials and Forms in Coloured Folders</th>
<th>Not possible</th>
</tr>
</thead>
<tbody>
<tr>
<td>• WAIS-IV Digit Span</td>
<td>• TOPF</td>
<td>• WAIS-IV Block Design</td>
<td></td>
</tr>
<tr>
<td>• WAIS – IV Similarities</td>
<td>• WAIS-IV Vocabulary</td>
<td>• WMS-IV Visual Reproduction</td>
<td></td>
</tr>
<tr>
<td>• HVLT-R</td>
<td>• WAIS-IV Matrix Reasoning</td>
<td>❖ BNT-2</td>
<td></td>
</tr>
<tr>
<td>• Semantic Fluency (Animals)</td>
<td>✗ MoCA</td>
<td>❖ RCFT</td>
<td></td>
</tr>
<tr>
<td>• Letter Fluency (FAS)</td>
<td></td>
<td>❖ Trail Making Test</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>❖ Stroop Test (Victoria Version)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>❖ Oral SDMT</td>
<td></td>
</tr>
</tbody>
</table>

- New Online Admin of MoCA has been released
- Not possible until publishers give permission for electronic test stimuli presentation
- Again, all the above depends on the cognitive behavioural status of your client
Some examples of potential workarounds? (a work in progress...)

<table>
<thead>
<tr>
<th>Cognitive Domain</th>
<th>Alternate Tests</th>
</tr>
</thead>
<tbody>
<tr>
<td>Word Retrieval</td>
<td>Expressive Vocabulary Test (Q-Global*)</td>
</tr>
<tr>
<td></td>
<td>SYDBAT</td>
</tr>
<tr>
<td>Visual Perception</td>
<td>VOSP (Q-Global*)</td>
</tr>
<tr>
<td>Visual Construction</td>
<td>Simple Copy</td>
</tr>
<tr>
<td></td>
<td>Clock Drawing</td>
</tr>
<tr>
<td>Visual Memory</td>
<td>Doors and People (Doors Subtest*)</td>
</tr>
<tr>
<td>Executive Functions</td>
<td>Hayling Sentence Completion Test</td>
</tr>
<tr>
<td></td>
<td>DKEFS subtests (Q Global*)</td>
</tr>
<tr>
<td></td>
<td>Dysexecutive Questionnaire</td>
</tr>
<tr>
<td></td>
<td>FrSBe</td>
</tr>
<tr>
<td>Attention</td>
<td>TEA (elevator counting with distraction)?</td>
</tr>
<tr>
<td></td>
<td>Oral Trail Making Test?</td>
</tr>
</tbody>
</table>

* No guarantees all these tests will be uploaded to Q Global. Need to wait and see...
Special recommendations for administering CELF-5 via telepractice

1. Audio/visual environment

2. Examiner factors

3. Examinee factors

4. Test/test materials

   - Make sure you have only one (1) image of the stimulus pictures showing to the examinee at any time.
   - Go to “full screen” with the stimulus pictures to eliminate distractions on the desktop/video window within the telepractice environment for the examinee.
   - The tests that have no visual stimulus should screen share the appropriate page in the digital stimulus book during the administration (a title page or blank page).
   - Four CELF-5 tests (Linguistic Concepts, Following Directions, Recalling Sentences, and Structured Writing) are in the process of being studied and the nature of administering the task by telepractice is more complicated. Descriptive reporting may be warranted if the administration is attempted and documentation of the exact procedures must be fully described in the report.

5. Other/miscellaneous
Evidence for use of Specific Measures over TeleNP and Patient Satisfaction
Many neuropsychological tests involve question-answer responses & require little equipment.

Which tests can be administered via video teleconference technology?

Some administration procedures for other tests could be modified for telemedicine application.
Teleneuropsychology Assessment Questions

• *Impact on reliability / validity?*

• Need for validation in the tele-environment?
  o Modified instructions/administration effects

• Applicability of norms?

• What populations are suitable for this assessment medium?
Most studies report similar outcomes to traditional face-to-face therapies*

- Similar diagnostic impressions in many disorders
- Good acceptability by patients & families
- Adequate to good acceptability by therapists
- Appears to be reasonable alternative, particularly when distance/time is a factor
- Cost-efficiency demonstration is complex

*Limited data for pediatric studies
Typical Video Teleconference (VC) setup

Implications for teleneuropsychology?
• Preliminary *neuropsychological* literature search in 2006 revealed < 10 studies, with varying samples and tests, though encouraging results

Early studies generally examined singular or a few brief screening tools (e.g., MMSE)

Designs varied
- Sample sizes generally small
- Limited tests examined
- Alternate test forms inconsistently used
- Counterbalancing often not done
- Use/role of remote assistants
- Normal vs. impaired subjects
Feasibility of Telecognitive Assessment in Dementia

C. Munro Cullum
Myron F. Weiner
Helena R. Gehrman
Linda S. Hynan
University of Texas Southwestern Medical Center at Dallas

Videoconferencing (VC) technology has been used successfully to provide psychiatric services to patients in rural and otherwise underserved settings. VC-based diagnostic interviewing has shown good agreement with conventional face-to-face diagnosis of dementia in several investigations, but extension of this technology to neuropsychological assessment has received little attention. To this end, the authors administered a brief battery of common neuropsychological tests via VC technology (telecognitive) and traditional face-to-face methods to 14 older persons with mild cognitive impairment (MCI) and 19 persons with mild to moderate Alzheimer’s disease (AD). Highly similar test scores were obtained when participants were tested in-person or via VC. Telecognitive assessment appears to be a valid means to conduct neuropsychological evaluation of older adults with cognitive impairment. Furthermore, continued development of VC technology has implications for expanding neuropsychological assessment options in underserved populations.

Keywords: neuropsychological testing; cognition; dementia; videoconferencing; telemedicine; telecognitive assessment
Teleneuropsychology: Larger Study Design

- Utilize common neuropsychological measures often used in assessment of dementia
- Tap multiple cognitive domains in brief fashion
- Tests amenable to videoconference environment
- Alternate test forms available for test-retest
Investigate:

- Feasibility
- Utility
- Acceptability
- Reliability
- Validity in different populations:

Largest study to date, including:
- Urban Caucasians
- Rural American Indians
- With and without dementia

NIH R01-AG27776-01A2
Teleneuropsychology Testing Setup
Teleneuropsychology Study Design

• 100 Urban Ss:
  • 50 healthy
  • 25 MCI
  • 25 AD

• 75 American Indians (Choctaw Nation):
  • 50 healthy
  • 25 AD/MCI
Teleneuropsychology Battery

- Mini Mental State Examination (MMSE)
- Hopkins Verbal Learning Test-Revised
- Digit Span (Forward & Backward)
- Letter Fluency
- Category Fluency
- Boston Naming Test (15-item version)
- Clock Drawing

- Alternate forms administered in counterbalanced fashion x condition
- Average test time designed to be < 45 minutes
Subjects

- $N = 203$ (119 control, 84 MCI / AD)
- Age: 46-90 yr, $M = 68.4$ ($SD = 9.6$)
- Education: 6-20 yr, $M = 14.1$ ($SD = 2.3$)
- 63% Female
## Results: Testing Time (Minutes) x Test Condition: Videoconference (VC) vs. Face-to-Face (FF)

<table>
<thead>
<tr>
<th>Test Condition</th>
<th>Mean</th>
<th>SD</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>VC Test Time</td>
<td>41.3</td>
<td>8.8</td>
<td>29</td>
<td>94</td>
</tr>
<tr>
<td>FF Test Time</td>
<td>36.3</td>
<td>7.1</td>
<td>24</td>
<td>74</td>
</tr>
</tbody>
</table>
Results: MMSE x Condition: Total Sample

ICC = .91, p < .0001
BNT-15, Letter & Category Fluency x Test Condition

![Graph showing BNT-15, Letter Fluency, and Category Fluency results.](Image)

*Cullum et al., JINS (2014)*
BNT-15, Letter & Category Fluency x Test Condition

Cullum et al., JINS (2014)
Digit Span & Clock Drawing x Test Condition

Cullum et al., JINS (2014)
Digit Span & Clock Drawing x Test Condition

Cullum et al., JINS (2014)
HVLT-R Learning x Test Condition

Cullum et al., JINS (2014)
HVLT-R Learning x Test Condition

HVLT Total score ICC = .80

Cullum et al., JINS (2014)
Video Teleconference Administration of the Repeatable Battery for the Assessment of Neuropsychological Status.

Galusha-Glasscock JM\(^1\), Horton DK\(^1\), Weiner MF\(^2\), Cullum CM\(^3\).

Abstract
Teleneuropsychology applications are growing, but a limited number of assessment tools have been studied in this context. The present investigation was designed to determine the feasibility and reliability of the Repeatable Battery for the Assessment of Neuropsychological Status (RBANS) administration by comparing video teleconference (VTC) with face-to-face (FF) test conditions. Eighteen adult subjects over age 55 with and without cognitive impairment were administered Forms A and B of the RBANS in VTC and FF settings in counterbalanced fashion. Similar RBANS scores were obtained in both test conditions, with generally high correlations between administration methods. Results support the feasibility and reliability of remote administration of the RBANS via VTC.
RBANS Results – FTF vs VTC

Remote Neuropsychological Assessment in Rural American Indians with and without Cognitive Impairment.

Wadsworth HE¹, Galusha-Glasscock JM², Womack KB³, Quiceno M⁴, Weiner MF², Hynan LS⁵, Shore J⁶, Cullum CM³.

Abstract

OBJECTIVE: To determine the feasibility and reliability of a brief battery of standard neuropsychological tests administered via video teleconference (VTC) to a sample of rural American Indians compared with traditional face-to-face administration.

METHODS: The sample consisted of 84 participants from the Choctaw Nation in Oklahoma, including 53 females and 31 males [M age = 64.89 (SD = 9.73), M education = 12.58 (SD = 2.35)]. Of these, 29 had a diagnosis of mild cognitive impairment or dementia, and 55 were cognitively normal. Tests included the MMSE, Clock Drawing, Digit Span Forward and Backward, Oral Trails, Hopkins Verbal Learning Test-Revised, Letter and Category Fluency, and a short form Boston Naming Test. Alternative forms of tests were administered in counterbalanced fashion in both face-to-face and VTC conditions. Intraclass correlation coefficients (ICCs) were used to compare test scores between test conditions across the entire sample.

RESULTS: All ICCs were significant (p< .0001) and ranged from 0.65 (Clock Drawing) to 0.93 (Boston Naming Test), with a mean ICC of 0.82.

CONCLUSION: Results add to the expanding literature supporting the feasibility and reliability of remote videoconference-based neuropsychological test administration and extend findings to American Indians.
Validity of Teleneuropsychological Assessment in Older Patients with Cognitive Disorders

Hannah E. Wadsworth¹, *, Kaltra Dhima¹, Kyle B. Womack¹,², John Hart, Jr¹,², Myron F. Weiner¹, Linda S. Hynan¹,³, C. Munro Cullum¹,²,⁴

¹Department of Psychiatry, University of Texas Southwestern Medical Center, Dallas, TX, USA
²Department of Neurology and Neurotherapeutics, University of Texas Southwestern Medical Center, Dallas, TX, USA
³Department of Clinical Sciences, University of Texas Southwestern Medical Center, Dallas, TX, USA
⁴Department of Neurological Surgery, University of Texas Southwestern Medical Center, Dallas, TX, USA

*Corresponding author at: Department of Psychiatry, University of Texas Southwestern Medical Center, Dallas, TX 75390, USA.
Tel.: +(214)-648-4675; fax: +(214)-648-4660.
E-mail address: hannah.wadsworth@utsouthwestern.edu (H.E. Wadsworth)

Editorial Decision 11 December 2017; Accepted 16 December 2017
Teleneuropsychology Validity

FF and VC results from subjects with vs without cognitive impairment

FF vs VC Adjusted Mean Differences

Table 2. ANCOVA: healthy controls vs. cognitively impaired participants in FTF and VTC test conditions after controlling for age, education, and gender.

<table>
<thead>
<tr>
<th>Test</th>
<th>FTF Adjusted Means (SD)</th>
<th>VTC Adjusted Means (SD)</th>
<th>Administration Corr.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Unimpaired</td>
<td>Impaired</td>
<td>Unimpaired</td>
</tr>
<tr>
<td>Clock Total</td>
<td>5.79 (.81)</td>
<td>5.40 (.82)</td>
<td>5.81 (.85)</td>
</tr>
<tr>
<td>Digit Span Forward</td>
<td>6.46 (1.39)</td>
<td>5.87 (1.40)</td>
<td>6.20 (1.33)</td>
</tr>
<tr>
<td>Digit Span Backward</td>
<td>4.91 (1.20)</td>
<td>4.45 (1.22)</td>
<td>4.76 (1.26)</td>
</tr>
<tr>
<td>BNT-15</td>
<td>14.01 (1.85)</td>
<td>12.22 (1.86)</td>
<td>13.83 (2.18)</td>
</tr>
<tr>
<td>HVLT-R Total</td>
<td>25.43 (5.48)</td>
<td>18.35 (5.60)</td>
<td>26.02 (5.66)</td>
</tr>
<tr>
<td>HVLT-R Delayed Recall</td>
<td>8.96 (3.28)</td>
<td>4.99 (3.35)</td>
<td>9.44 (2.98)</td>
</tr>
<tr>
<td>FAS</td>
<td>41.69 (12.07)</td>
<td>34.19 (12.20)</td>
<td>40.68 (12.31)</td>
</tr>
<tr>
<td>Animals</td>
<td>18.46 (4.76)</td>
<td>14.38 (4.89)</td>
<td>18.76 (5.07)</td>
</tr>
</tbody>
</table>

• Telecognitive testing in older subjects is feasible with minimal support at far end (at least when MMSE ≥ 15)

• Testing in VC and FTF conditions yielded similar results across tests examined and in urban Caucasian and rural American Indian groups.

• Validity supported by ability of tests to distinguish impaired vs non-impaired groups equally well in each condition (MCI + AD vs NC)
<table>
<thead>
<tr>
<th>GLOBAL COGNITIVE</th>
<th>LANGUAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>MMSE, Ammons Quick Test,</td>
<td>Phonemic &amp; Category Fluency,</td>
</tr>
<tr>
<td>CAMCOG, NART, SPMSQ, WASI,</td>
<td>Boston Naming Test,</td>
</tr>
<tr>
<td>MoCA</td>
<td>WAIS-III Vocabulary,</td>
</tr>
<tr>
<td></td>
<td>BDAE Picture Description,</td>
</tr>
<tr>
<td></td>
<td>MAE Aural Comprehension</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ATTENTION / INFO PROCESSING</th>
<th>VISUOSPATIAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Digit Span, Symbol Digit Modalities, Trail Making Test, Brief Test of Attention, Seashore Rhythm Test, Adult Memory &amp; Information Processing</td>
<td>Clock Drawing, WAIS-III Matrix Reasoning, Beery VMI, Visual Object &amp; Space Perception</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>EPISODIC MEMORY</th>
<th>PSYCHOMOTOR</th>
</tr>
</thead>
<tbody>
<tr>
<td>HVLT, CVLT-II Short Form,</td>
<td>Grooved Pegboard</td>
</tr>
<tr>
<td>RAVLT, Modified Rey-O Figure, WMS-R Logical Memory, Benton Visual Retention Test, Adult Memory &amp; Information Processing</td>
<td></td>
</tr>
</tbody>
</table>
Evidence for NP Tests Administered via VC

12 Studies met criteria (N = 497)

Of 79 scores

- FTF > VTC in 61%
- VTC > FTF in 33%
- FTF = VTC in 6%

Conclusion: No effect of VC vs FTF; 1/10th SD diff.
Consumer Acceptability of Teleneuropsychology

- 98% satisfied with videoconference testing

- Instructions during VC testing easy to understand

- Not concerned about privacy during VC testing

- 60% no preference for test condition (30% preferred FTF, vs. 10% VC)

Parikh, Grosch, Graham, Hynan, Weiner, Shore, & Cullum, TCN (2013)
• 29% felt VC was more “fun”

• 34% felt it was easier to communicate with examiner FTF

• 15% felt VC made them less nervous

• What about effects of cognitive impairment on acceptability?

Parikh, Grosch, Graham, Hynan, Weiner, Shore, & Cullum, TCN (2013)
Consumer Acceptability of Teleneuropsychology

From: Parikh, Grosch, Graham, Hynan, Weiner, Shore, & Cullum, TCN (2013)
Teleneuropsychology Assessment: Summary

- Teleneuropsychology research results *suggest*:
  - *Feasibility*
  - *Applicable in rural and urban settings*
  - *Reliability*
  - *Validity*
  - *Accepted & well-tolerated by subjects*

*for those tests and groups studied to date, and with caveats*
Research Caveats

- Much research done in controlled clinic settings
- Good internet connectivity
- Volunteer participants
- Standard videoconference equipment
  - Screen size / view of examiner and stimuli
  - Distance from screen / mobile camera
- Brief assessments
- Detailed protocols & experienced examiners guiding testing
- Many opportunities for TeleNP research!
Aim: To understand the experiences of clinicians who had delivered the same memory rehabilitation program in telehealth and face-to-face (F2F) formats (n=9), and participants with stroke (n=25), in order to explore:

- Perceived benefits and challenges of the telehealth format
- Potential barriers to clinical implementation of telehealth neurorehabilitation services
**ROLE/BENEFITS OF TELEREHAB**

- **Clinician experience**
  - Higher demands on clinicians in TH compared to F2F*
  - F2F was more confronting and draining for the clinician than TH
  - No significant differences for clinicians between the three modes
  - Clinician experience of TH was enjoyable
  - Clinician open to working with TH in the future*

---

“…when you are talking over the internet it's almost like you need to add a little bit more animation to make sure that it translates a bit more… often I would find that I would leave those sessions quite tired as a clinician”

"I would definitely not hesitate to do this type of intervention in the future"
• Building rapport
  - Rapport is positive or deeper in TH*
  - Harder to create rapport in TH
  - Rapport is more casual / less clinical in TH
  - Relaxed rapport in TH associated with missed sessions/being late for sessions/not adhering to homework
  - Overcoming technical issues to maintain rapport
  - Technological issues can undermine rapport
  - Sense of distance creates limitations for managing emotional content / risk cases*
  - Clinician wanted to meet TH participant in person

“I was concerned going in but to be totally honest I did not have any issues building rapport with people over the internet”

“It was obvious that she was upset… if it was face to face, resolving it would have been a bit easier. I think that was the only time I really felt the distance and felt it would have been better to be there.”
**Communication challenges**

"... I found that sometimes it was harder to pick up on non-verbal cues and actually try and gauge how a person is feeling in the room"

"Yeah I found it fairly natural and I don’t see it as being anything different than if I was sitting in your office and we were talking across a table. So I feel it's pretty well the same thing" *62 yo stroke survivor*
Technological issues

- Quality of internet access is more of a barrier / problem in TH*
- Technological issues in TH were mainly participant-end: e.g. logging in, getting camera or camera working
- Participant comfort with technology in TH
- Impact of clinician’s own comfort levels with technology
- Did not encounter significant technological issues in TH
- Variety of technology (e.g. different types of smartphones owned by participants)

“I had a patient in North Queensland who had some pretty flaky internet, so we had a few times we had dropouts and had to reconnect.”

“I found Zoom really easy to use and love that it allows us to connect even though you are in a different city to me.” (47 yo stroke survivor)
## Patient Satisfaction from TeleNP in Stroke Rehabilitation

<table>
<thead>
<tr>
<th>Question</th>
<th>N</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Previous Skype, Facetime or another videoconference program use</td>
<td>13</td>
<td>32%</td>
</tr>
<tr>
<td>Previous telehealth appointment with any health professional?</td>
<td>2</td>
<td>11%</td>
</tr>
<tr>
<td>I could see the neuropsychologist clearly</td>
<td>18</td>
<td>95%</td>
</tr>
<tr>
<td>I could hear the neuropsychologist clearly</td>
<td>17</td>
<td>89%</td>
</tr>
<tr>
<td>I could see all test/therapy materials presented on the screen clearly</td>
<td>16</td>
<td>84%</td>
</tr>
<tr>
<td>During the consultation, I felt comfortable interacting with the neuropsychologist</td>
<td>17</td>
<td>89%</td>
</tr>
<tr>
<td>Overall, I was satisfied with the consultation via telehealth</td>
<td>17</td>
<td>89%</td>
</tr>
<tr>
<td>In the future, I would prefer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Telehealth consultation</td>
<td>1</td>
<td>5%</td>
</tr>
<tr>
<td>In-person consultation</td>
<td>3</td>
<td>16%</td>
</tr>
<tr>
<td>I do not mind either way</td>
<td>15</td>
<td>79%</td>
</tr>
</tbody>
</table>
# Patient Satisfaction from TeleNP in Stroke Rehabilitation

How long would you be willing to wait to have an in person, face to face neuropsychology consultation rather than a teleneuropsychology consultation?

<table>
<thead>
<tr>
<th>Option</th>
<th>Count</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>I would rather receive a telehealth consultation</td>
<td>11</td>
<td>58%</td>
</tr>
<tr>
<td>1-7 days</td>
<td>3</td>
<td>16%</td>
</tr>
<tr>
<td>1-4 weeks</td>
<td>1</td>
<td>5%</td>
</tr>
<tr>
<td>I would wait as long as it takes to have a face-to-face consultation</td>
<td>2</td>
<td>11%</td>
</tr>
</tbody>
</table>

How long would you be willing to travel in order to receive an in person, face to face neuropsychology consultation rather than teleneuropsychology consultation?

<table>
<thead>
<tr>
<th>Option</th>
<th>Count</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>I would rather receive a telehealth consultation</td>
<td>15</td>
<td>79%</td>
</tr>
<tr>
<td>Less than 1 hour</td>
<td>1</td>
<td>5%</td>
</tr>
<tr>
<td>1-3 hours</td>
<td>2</td>
<td>11%</td>
</tr>
</tbody>
</table>
Pediatric Need

HI SWEETIE, HOW WAS SCHOOL TODAY?

YOU CAN READ ALL ABOUT IT ON MY BLOG, DAD.
Pediatric Tele-Assessment

- Waite et al., 2010
  - Twenty-five participants ages 5-9 years
  - Internet-based assessment of language using the CELF-4
  - Split into videoconference (VC) and face-to-face sessions and had additional in person or remote raters simultaneously recording and scoring
  - No significant differences were found

- Hodge et al, 2019
  - Thirty-three participants age 8 to 12 years with LD in reading
  - WISC-V administered and scored by a remote psychologist
  - Simultaneous scoring by an in person psychologist
  - Ratings between psychologists were highly correlated
  - Determined telehealth is a feasible and reliable method
Goals of the Current Project

• Determine if neuropsychological assessment via home-based VC produces similar results as traditional face-to-face testing
• Examine feasibility
• Determine if this method is satisfactory to participants and parents
Method

• Recruited participants from Neurology clinic for demyelinating disorders
  • Outside 30 days of acute symptoms and/or steroid use
• Two sessions:
  • Brief neuropsychological battery administered once face-to-face at the clinic visit and via VC from participant’s home
  • Counterbalanced groups for order of sessions:
    • Face-to-Face first (52%)
    • Video conference first (48%)
• Alternate forms used when available
Demographics (N=58)

- **Age**
  - Range 7 to 20 years
  - Mean = 13.11

- 61% female

- **Race**
  - 84% White
  - 5% Black or African American
  - 4% Asian
  - 7% Other

- **Ethnicity**
  - 42% Hispanic
  - 58% Non-Hispanic

- 16% Primary Caregiver Language Spanish

- **Mileage from Children’s**
  - Range 3 to 2,033 miles
  - Mean = 147 miles
# Sample Characteristics

<table>
<thead>
<tr>
<th></th>
<th>In Person First N=30</th>
<th>Video First N=28</th>
</tr>
</thead>
<tbody>
<tr>
<td>Same Examiner</td>
<td>97%</td>
<td>96%</td>
</tr>
<tr>
<td>Age</td>
<td>13.23</td>
<td>12.96</td>
</tr>
<tr>
<td>Days Between Sessions</td>
<td>18</td>
<td>15</td>
</tr>
<tr>
<td>Miles from Children’s*</td>
<td>262</td>
<td>18</td>
</tr>
</tbody>
</table>
Participant Device

- 67% had their own device
- 23% borrowed a study device (iPad)
- Examiner device below

Smartphones were not used
Video-Conference Platform

- Secure encryption
  - HIPAA Secure
- Point-to-point transmission
  - No recording of data
- Low bandwidth
- Participants provided with a generic login
<table>
<thead>
<tr>
<th>Domains Assessed</th>
<th>Measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Verbal Abilities</td>
<td>WISC-V/ WAIS-IV Vocabulary</td>
</tr>
<tr>
<td>Processing speed</td>
<td>Symbol-Digit Modalities Test (SDMT)</td>
</tr>
<tr>
<td>Visual-motor integration</td>
<td>Beery-Buktenica Developmental Test of Visual-Motor Integration (VMI)</td>
</tr>
<tr>
<td>Visual perception</td>
<td>VMI Visual Perception (VP)</td>
</tr>
<tr>
<td>Simple auditory attention</td>
<td>WISC-V/ WAIS-IV Digits Forward</td>
</tr>
<tr>
<td>Working memory</td>
<td>WISC-V/ WAIS-IV Digits Backward</td>
</tr>
<tr>
<td>Verbal learning and memory</td>
<td>California Verbal Learning Test – Children’s Version (CVLT-C)/Second Edition (CVLT-II)</td>
</tr>
<tr>
<td>Verbal Fluency</td>
<td>D-KEFS Letter and Category Fluency</td>
</tr>
<tr>
<td>Rapid Naming and Inhibition</td>
<td>D-KEFS Color Word Interference</td>
</tr>
<tr>
<td>Academic Skills</td>
<td>WJ-III Achievement Letter-Word ID, Calculation, Math Fluency, Reading Fluency, Word Attack</td>
</tr>
</tbody>
</table>
Participant Instructions

Prior to VC visit
- Do not open the packet until you are instructed to do so
- You will need a quiet, distraction-free setting
- Seating at a desk or table with writing utensils
- Borrowed iPad: access is restricted until the session begins

Beginning of Session
- Access code to borrowed iPad provided
- Speak to parent and obtain a good contact number if needed
- Remind them to remove anything that could be a distraction

Following Assessment
- Place all materials in the addressed stamped envelope
- Seal the packet before finishing the session
- Drop it in the mail or bring to your next session
Threats to Collecting Quality Data

- Technical difficulty
  - 21% of VC-based sessions
  - Included
    - Freeze screen
    - "Choppy" connection
    - Loss of connection
    - Poor resolution
  - <1% invalidation of tests
- Brief distractions
  - Occurred in 47% of VC-based sessions
RESULTS
D-KEFS

- Scaled Scores
- Method:
  - Face-to-Face
  - Teleconference

- Color Name
- Word Read
- Inhibition
WJ-III Achievement
Wechsler:
Digit Span and Vocabulary

![Box plot showing scaled scores for different methods and tasks]
VMI and SDMT

The image shows a box plot comparing standard scores for VMI (Visual Motor Integration), VP, and SDMT (Spatial-Sequential Memory Test) under two methods: Face-to-Face and Teleconference.
CVLT

![Box plot comparing standard scores across different methods and trials.](image)
PARENT AND PARTICIPANT SATISFACTION
Satisfaction:
I felt comfortable with the equipment used
Satisfaction:
VC-based cognitive testing was as acceptable to me as in-person testing
Satisfaction:
Overall, I was satisfied with the VC-based testing session
Satisfaction:
If given a choice, I prefer…
Limitations and Challenges

- Violation of standardized procedures
- Limitations of behavioral observations
- Distractions in remote (home) environment
- Reduced test options for VC setting
- Coordination and planning of VC sessions
- Patient access to technology
- Variability in technology performance
Conclusions

• Promising findings supporting the use of pediatric home-based VC-based neuropsychological assessment
• VC-based assessment may provide opportunities to patients, clinicians, and researchers
• Individual providers must give careful consideration of the limitations of this approach as well as ethical and practical challenges
Practical Considerations for Home-Based TeleNP

Goal – to simulate the in-person experience. Use this idea to guide your decisions as you set up and carry out sessions including who you bring into the room for each step of the evaluation.

Please refer to iopc.online
Pre-Session

• Utilize usual screening and triage procedures to determine most appropriate service and provider (language screening, age, medical diagnosis, etc.).
• Determine if patient is appropriate for video-based testing.
  – Patient’s age, developmental level, cognitive functioning, level of independence, ability to regulate behavior, etc.
• Evaluate patient access to required technology (phone, computer, tablet, internet, service plan and data/minutes available). Consider ways to make technology available.
• Assist patient family in identifying a suitable device for the evaluation. If participant is expected to view stimuli, screen larger than a typical smartphone, such as a computer or tablet, is strongly recommended.
• If applicable, provide any needed materials ahead of time and instruct patient family not to open or view materials until instructed to do so during the session.

Information adapted from iopc.online
Beginning of Session

• Confirm location (address) of the patient.
• Obtain a phone number from the parent/guardian at the beginning of sessions in the event you need to make contact during the video session. Make sure parent/guardian also has your number.
• Ensure patient has all needed materials as well as glasses, hearing aids, etc., if applicable.
• Begin and end sessions with parent/guardian in the room. Remind parent/guardian to remain in the house, especially if patient is a minor or requires onsite supervision.
• Review what you will do if connection is lost with both parent/guardian and patient. For example, patient will be instructed to find caregiver and contact will be made by phone while attempts are made to reconnect the videoconference.

Information adapted from iopc.online
Environment

- Ensure a quiet, distraction-free space away from noise, pets, cell phones, etc. without expected interruptions. This may be particularly difficult in the context of the COVID-19 restrictions. Assist patient family in scanning the room for potentially distracting stimuli. Headphones connected to the videoconferencing device may assist in eliminating distractions.
- Consider having patient hide the self-view on their screen, as this could be a source of distraction.
- Arrange the camera in an optimal position to maximize viewing of the patient in order to observe the patient’s work and make behavioral observations. This is likely to be limited compared to in person assessment.
- Patient family may consider placing a sign on the door as we do in our clinics.
- Instruct patient family to find a flat surface (i.e., table, desk) and writing utensils for the patient, especially if they are going to be asked to write anything.

Information adapted from iopc.online
Throughout the Session

• Important to track and document the following:
  – Technological problems such as lost connection, audio/visual outage, lag in video, etc.
  – Environmental interruptions and distractions including sounds, family member or pet walking in, etc.
  – Other threats to validity noted during the session
End of Session and Wrap Up

• Ask the patient to call parent/caregiver back to the room to conclude the session, if applicable. Call by phone, if needed.
• If applicable, instruct patient family to collect and place all materials in an envelope and seal it in preparation to mail it back to you as soon as possible. To minimize barriers, consider providing a self-addressed envelope with pre-paid postage.
• Provide patient family with information on next steps before signing off.

Information adapted from iopc.online
Summary and Our Final Thoughts

• A variety of models and platforms exist for the delivery of TeleNP services
  • “Tele-Interview” TeleNP model with in-person testing
  • Assistant Proctored “Full TeleNP” model with MA present in clinic
  • In-Clinic Hybrid “Full TeleNP” model
  • Direct-To-Home “Full Tele-Health” model directly in patient’s residence

• Preliminary evidence suggests equivalence between face-to-face and videoconference delivery for many, but not all, common cognitive tests
  • Feasibility, reliability, validity*, and generally accepted and well-tolerated

• If patients do not have the technology capacity (e.g., computer, internet, etc.), don’t forget that some verbal screenings can occur over telephone
  • TICS/mTICS, COGTEL, T-MOCA
• Practice of Direct-to-Home TeleNP appears to be a valid contribution - for some patients and clinical presentations - to the field during this time of COVID-19 quarantines

• For providers attempting Direct-to-Home TeleNP service provision, a myriad of potential challenges exist, with heightened responsibility on the provider for:
  • maintaining test security
  • maintaining standardization conditions
  • ensuring the maximum validity of data collection
  • ensuring no mis-interpretation or over-interpretation of findings

• It is strongly recommended that Direct-to-Home TeleNP is considered based solely on the urgent clinical need of the patient, as compared to the financial concerns of the provider or logistics of clinic
Funding Sources

- NIH
- National Multiple Sclerosis Society
- Children’s Trust
- Safer Care Victoria, Australia
Resources

- Interorganizational Practice Committee (iopc.online):
  - Recommendations/Guidance for Teleneuropsychology (TeleNP) in Response to the COVID-19 Pandemic
- American Psychological Association
  - www.apa.org
- Australian Psychological Society
  - Ethical guidelines for providing psychological services and products using the internet and telecommunications
  - Ethical guidelines for psychological assessment and the use of psychological tests
- American Telemedicine Association
  - www.americantelem.org
  - Telemental health scientific interest group
- Australian Telehealth Society
- American Psychiatric Association
  - www.psychiatry.org
- State Licensing Boards
- Association of State and Provincial Psychology Boards (ASPPB)
  - Psychology Interjurisdictional Compact (PSYPACT)
- Guidelines for the Practice of Telepsychology provided by the APA, ASPPB, APAIT Joint Task Force
- American Telemedicine Association
  - March 2017: Practice Guidelines for Telemental Health with Children and Adolescent