**Supplemental Material 1: HL1: Demographic and Medical History Inventories**

Use the CRF “Tab 2 Case Record Form” developed by the COVID-19 Neuro Network which is available at: <https://braininfectionsglobal.tghn.org/covid-neuro-network/>. This CRF includes the Modified Rankin Score (mRS), a 6-point disability scale - instructions and questionnaire can be found for free (https://manual.jointcommission.org/releases/TJC2018A/DataElem0569.html).

The CRF also includes the Glasgow Coma Scale (GCS). This exam can also be used to ascertain the patient’s alertness status and their capacity to complete cognitive testing. The GCS is available at <https://www.glasgowcomascale.org/> in English and 35 other languages. Neuropsychological testing should only be conducted if the patient has a perfect normal score on the GCS (i.e., 15). Further, the website includes videos and tutorials. Blood test results, chest imaging, and other laboratory investigations are optional. The Tab 4 Neuro Case Definitions may be completed as an option as well.

**Supplemental Material 1: HL1: Smell questionnaire**

|  |
| --- |
| 6-item Smell and Taste questionnaires  National Health and Nutrition Examination Survey 2013-2014  Taste & Smell (CSQ\_H) Adapted Questionnaire |
| Mode of Administration: [ ] Participant read and answered items independently. [ ] Items read by examiner/caregiver. [ ] Examiner/Caregiver read items, and marked verbal given answers. [ ] Examiner/Caregiver marked answers given verbally. |
| Please carefully read each question and tick the response which applies |

|  |
| --- |
| The next questions are about [your/the person you care for sense of smell |
| CSQ010: During the past 12 months *before COVID-19 diagnosis*, [have you/they] had a problem with [your/their] ability to smell, such as not being able to smell things or things not smelling the way they are supposed to? |
| |  |  |  | | --- | --- | --- | | Code | Value Description | Tick | | 1 | Yes |  | | 2 | No |  | | 9 | Don't know |  | |
| CSQ020: (baseline only) How would [you/the person you care for] rate [your/their] ability to smell now as compared to when [you/they were] at your best? Is it better, worse or is there no change? |
| |  |  |  | | --- | --- | --- | | Code | Value Description | Tick | | 1 | Better Now |  | | 2 | Worse Now |  | | 3 | No Change |  | | 9 | Don't know |  | |
| Since [your/their] COVID-19 diagnosis |
| CSQ888-0: [have you/they] had a problem with [your/their] ability to smell, such as not being able to smell things or things not smelling the way they are supposed to? |
| |  |  |  |  | | --- | --- | --- | --- | | Code | Value Description | Tick |  | | 1 | Yes |  |  | | 2 | No |  | GO TO CSQ080 | | 9 | Don't know |  | GO TO CSQ080 | |
| CSQ070: Is the problem with [your/the person you care for] ability to smell always there or does it come and go? |
| |  |  |  | | --- | --- | --- | | Code | Value Description | Tick | | 1 | It is always there |  | | 2 | It comes and goes |  | | 9 | Don't know |  | |
| The next questions are about [your/the person you care for] sense of taste |
| CSQ080: During the past 12 months *before COVID-19 diagnosis*, [have you/the] had a problem with [your/their] ability to taste sweet, sour, salty or bitter foods and drinks? |
| |  |  |  | | --- | --- | --- | | Code | Value Description | Tick | | 1 | Yes |  | | 2 | No |  | | 9 | Don't know |  | |
| Since [your/their] COVID-19 diagnosis |
| CSQ888-1: have [you/they] had a problem with [your/their] ability to taste sweet, sour, salty or bitter foods and drinks? |
| |  |  |  | | --- | --- | --- | | Code | Value Description | Tick | | 1 | Yes |  | | 2 | No |  | | 9 | Don't know |  | |

*NB*: Question CSQ020 was modified to accommodate all adult ages starting from 18 years of age.

**Supplemental Material 1: HL1: Psychological and global health**

The DASS information and scales in >50 languages are downloadable from

<http://www2.psy.unsw.edu.au/dass/>

We recommend that investigators carefully consult the scale manual on how to use and cite this tool.

**Supplemental Material 1: HL1: Cognitive symptoms**

|  |  |
| --- | --- |
| Table  Description automatically generated | Table  Description automatically generated |
| Table  Description automatically generated | Table  Description automatically generated |

We provide the English version of Patient Assessment of Own Functioning Inventory (PAOFI), and we will facilitate access to other languages versions, as well as adaptation and translation. The original questionnaire developer (Prof. Robert K. Heaton, also member of the NeuroCOVID SIG) has authorized the questionnaire’s reproduction.

**Supplemental Material 2: HL2: Basic perceptual functions and behavior**

Vision, hearing and behavioral comments box

The examiner should ensure correct/adequate (with the use of glasses or hearing devices) visual and hearing capacities in the examinee. (tick box)

|  |  |
| --- | --- |
| Correct vision |  |
|  |  |
| Correct hearing |  |
|  |  |

Note any important behavioral information that may be relevant in interpreting the neuropsychological test results (e.g., long nails, broken or missing fingers, cooperation, anxiety levels etc…)

|  |
| --- |
| Behavioral Comments box |
|  |

**Supplemental Material 2**: HL2: Demographic and Medical History Inventories

Use same as for HL1 and consider adding suggested other demographic characteristics from supplemental material 3: HL3.

**Supplemental Material 2: HL2: Self-report smell/taste questionnaires**

|  |
| --- |
| Smell and Taste questionnaires  National Health and Nutrition Examination Survey 2013-2014 Taste & Smell (CSQ\_H)(Bhattacharyya & Kepnes, 2015) adapted questionnaire |
| Mode of Administration: [ ] Participant read and answered items independently. [ ] Items read by examiner/caregiver. [ ] Examiner/Caregiver read items, and marked verbal given answers. [ ] Examiner/Caregiver marked answers given verbally. |
| Please carefully read each question and tick the response which applies |
| The next questions are about [your/the person you care for] sense of smell. |
| CSQ010: During the past 12 months *before COVID-19 diagnosis*, [have you/they] had a problem with [your/their] ability to smell, such as not being able to smell things or things not smelling the way they are supposed to? |
| |  |  |  | | --- | --- | --- | | Code | Value Description | Tick | | 1 | Yes |  | | 2 | No |  | | 9 | Don't know |  | |
| CSQ020 (baseline only): How would [you/the person you care for] rate [your/their] ability to smell now as compared to when [you/they were] 25 years old? Is it better, worse or is there no change? |
| |  |  |  | | --- | --- | --- | | Code | Value Description | Tick | | 1 | Better Now |  | | 2 | Worse Now |  | | 3 | No Change |  | | 9 | Don't know |  | |
| Since [your/their] COVID-19 diagnosis |
| CSQ888-0: [have you/has he/has she, they] had a problem with [your/his/her/their] ability to smell, such as not being able to smell things or things not smelling the way they are supposed to? |
| |  |  |  |  | | --- | --- | --- | --- | | Code | Value Description | Tick |  | | 1 | Yes |  |  | | 2 | No |  | GO TO CSQ080 | | 9 | Don't know |  | GO TO CSQ080 | |
| CSQ070: Is the problem with [your/SP's] ability to smell always there or does it come and go? |
| |  |  |  | | --- | --- | --- | | Code | Value Description | Tick | | 1 | It is always there |  | | 2 | It comes and goes |  | | 9 | Don't know |  | |
| The next questions are about [your/the person you care for] sense of taste. |
| CSQ080: During the past 12 months *before COVID-19 diagnosis*, [have you/they] had a problem with [your/their] ability to taste sweet, sour, salty or bitter foods and drinks? |
| |  |  |  | | --- | --- | --- | | Code | Value Description | Tick | | 1 | Yes |  | | 2 | No |  | | 9 | Don't know |  | |
| Since [your/their] COVID-19 diagnosis |
| CSQ888-1: have you/they] had a problem with [your/their] ability to taste sweet, sour, salty or bitter foods and drinks? |
| |  |  |  | | --- | --- | --- | | Code | Value Description | Tick | | 1 | Yes |  | | 2 | No |  | | 9 | Don't know |  | |
| CSQ090A: I am going to read you a list of tastes in everyday foods. How [is your/the person you care for] ability to taste each one of these now compared to when [you/they were] *before COVID-19 diagnosis*? Would you say it is better, worse, or is there no change? salt in foods like potato chips or pretzels. |
| |  |  |  | | --- | --- | --- | | Code | Value Description | Tick | | 1 | Better |  | | 2 | Worse |  | | 3 | No Change |  | | 9 | Don't know |  | |
| CSQ090B: I am going to read you a list of tastes in everyday foods. How [is your/the person you care for] ability to taste each one of these now compared to when [you/they were] *before COVID-19 diagnosis*? Would you say it is better, worse, or is there no change? sourness in foods like lemons or vinegar. |
| |  |  |  | | --- | --- | --- | | Code | Value Description | Tick | | 1 | Better |  | | 2 | Worse |  | | 3 | No Change |  | | 9 | Don't know |  | |
| CSQ090C: I am going to read you a list of tastes in everyday foods. How [is your/the person you care for] ability to taste each one of these now compared to when [you/they were] *before COVID-19 diagnosis*? Would you say it is better, worse, or is there no change? sweetness in foods like peaches or ice cream. |
| |  |  |  | | --- | --- | --- | | Code | Value Description | Tick | | 1 | Better |  | | 2 | Worse |  | | 3 | No Change |  | | 9 | Don't know |  | |
| CSQ090D: I am going to read you a list of tastes in everyday foods. How [is your/the person you care for] ability to taste each one of these now compared to when [you/they] *before COVID-19 diagnosis*? Would you say it is better, worse, or is there no change? bitterness in drinks like unsweetened black coffee. |
| |  |  |  | | --- | --- | --- | | Code | Value Description | Tick | | 1 | Better |  | | 2 | Worse |  | | 3 | No Change |  | | 9 | Don't know |  | |
| CSQ100: Is [your/the person you care for] ability to taste food flavors such as chocolate, vanilla or strawberry as good as *before COVID-19 diagnosis*? |
| |  |  |  | | --- | --- | --- | | Code | Value Description | Tick | | 1 | Yes |  | | 2 | No |  | | 9 | Don't know |  | |
| CSQ110: Since COVID-19 diagnosis, [have you/has the person you care for] had a taste or other sensation in [your/their] mouth that does not go away? |
| |  |  |  | | --- | --- | --- | | Code | Value Description | Tick | | 1 | Yes |  | | 2 | No |  | | 9 | Don't know |  | |
| CSQ120A: Please describe the taste or other sensation in [your/the person you care for] mouth that does not go away. Would [you/they] say it is... |
| |  |  |  | | --- | --- | --- | | Code | Value Description | Tick | | 1 | Sweet |  | | 99 | Don't know |  | |
| CSQ120B: Please describe the taste or other sensation in [your/the person you care for] mouth that does not go away. Would [you/they] say it is... |
| |  |  |  | | --- | --- | --- | | Code | Value Description | Tick | | 2 | Sour |  | |
| CSQ120C: Please describe the taste or other sensation in [your/the person you care for] mouth that does not go away. Would [you/they] say it is... |
| |  |  |  | | --- | --- | --- | | Code | Value Description | Tick | | 3 | Salty |  | |
| CSQ120D: Please describe the taste or other sensation in [your/the person you care for] mouth that does not go away. Would [you/they] say it is... |
| |  |  |  | | --- | --- | --- | | Code | Value Description | Tick | | 4 | Bitter |  | |
| CSQ120E: Please describe the taste or other sensation in [your/the person you care for] mouth that does not go away. Would [you/they] say it is... |
| |  |  |  | | --- | --- | --- | | Code | Value Description | Tick | | 5 | Metallic | 61 | |
| CSQ120F: Please describe the taste or other sensation in [your/the person you care for] mouth that does not go away. Would [you/they] say it is... |
| |  |  |  | | --- | --- | --- | | Code | Value Description | Tick | | 6 | Burning or Tingling |  | |
| CSQ120G: Please describe the taste or other sensation in [your/the person you care for] mouth that does not go away. Would [you/they] say it is... |
| |  |  |  | | --- | --- | --- | | Code | Value Description | Tick | | 7 | Bad or Foul |  | |
| CSQ120H: Please describe the taste or other sensation in [your/the person you care for] mouth that does not go away. Would [you/they] say it is... |
| |  |  |  | | --- | --- | --- | | Code | Value Description | Tick | | 8 | or Something else |  |  Describe below |
| CSQ190: Since COVID-19, [have you/has the person you care for] experienced a problem with [your/their] general health, work or [your/their] enjoyment of life because of a problem with [your/their) ability to taste or smell? |
| |  |  |  | | --- | --- | --- | | Code | Value Description | Tick | | 1 | Yes |  | | 2 | No |  | | 9 | Don't know |  | |
| CSQ200: During the past 12 months (*besides COVID-19*), [have you/has the person you care for] had any of the following ...a head cold or flu for longer than a month? |
| |  |  |  | | --- | --- | --- | | Code | Value Description | Tick | | 1 | Yes |  | | 2 | No |  | | 9 | Don't know |  | |
| CSQ202: During the past 12 months, [have you/has the person you care for] had any of the following ... persistent dry mouth (not enough saliva)? |
| |  |  |  | | --- | --- | --- | | Code | Value Description | Tick | | 1 | Yes |  | | 2 | No |  | | 9 | Don't know |  | |
| CSQ204: During the past 12 months, [have you/has the person you care for] had any of the following ...frequent nasal congestion from allergies? |
| |  |  |  | | --- | --- | --- | | Code | Value Description | Tick | | 1 | Yes |  | | 2 | No |  | | 9 | Don't know |  | |
| CSQ210: [have you/has the person you care for] ever had any of the following? wisdom teeth removed. |
| |  |  |  | | --- | --- | --- | | Code | Value Description | Tick | | 1 | Yes |  | | 2 | No |  | | 9 | Don't know |  | |
| CSQ220: [have you/has the person you care for] ever had any of the following? tonsils removed. |
| |  |  |  | | --- | --- | --- | | Code | Value Description | Tick | | 1 | Yes |  | | 2 | No |  | | 9 | Don't know |  | |
| CSQ240: [have you/has the person you care for] ever had any of the following? a loss of consciousness because of a head injury. |
| |  |  |  | | --- | --- | --- | | Code | Value Description | Tick | | 1 | Yes |  | | 2 | No |  | | 9 | Don't know |  | |
| CSQ250: [have you/has the person you care for] ever had any of the following? a broken nose or other serious injury to face or skull. |
| |  |  |  | | --- | --- | --- | | Code | Value Description | Tick | | 1 | Yes |  | | 2 | No |  | | 9 | Don't know |  | |
| CSQ260: [have you/has the person you care for] ever had any of the following? two or more sinus infections. |
| |  |  |  | | --- | --- | --- | | Code | Value Description | Tick | | 1 | Yes |  | | 2 | No |  | | 9 | Don't know |  | |
| AUQ136: [have you/has the person you care for] ever had 3 or more ear infections? Please include ear infections [you/he/she] may have had when [you were/he was/she was] a child. |
| |  |  |  | | --- | --- | --- | | Code | Value Description | Tick | | 1 | Yes |  | | 2 | No |  | | 9 | Don't know |  | |
| AUQ138: [have you/has the person you care for] ever had a tube placed in [your/his/her] ear to drain the fluid from [your/his/her] ear? |
| |  |  |  | | --- | --- | --- | | Code | Value Description | Tick | | 1 | Yes |  | | 2 | No |  | | 9 | Don't know |  | |

**Supplemental Material 2: HL2: Cognitive symptoms**

**To follow the priority recommendations, use PAOFI as for HL1**

Other options may be considered

|  |
| --- |
| Cognitive symptoms   * Cognitive Failures Questionnaire (<https://www.ocf.berkeley.edu/~jfkihlstrom/ConsciousnessWeb/Meditation/CFQ.htm>) * The A-B Neuropsychological Assessment Schedule (ABNAS): The Further Refinement of a Patient-Based Scale of Patient-Perceived Cognitive Functioning <https://pubmed.ncbi.nlm.nih.gov/11248534/>; <https://pubmed.ncbi.nlm.nih.gov/12027569/> |

**Supplemental Material 2: HL2: Objective olfaction, taste testing options and recommended priority**

|  |  |
| --- | --- |
| Objective Olfaction testing | |
| 1. **NIH Toolbox olfaction test (Dalton et al., 2013)** | **Test cards are less expensive than the UPSIT (see link below for details). Validated against the UPSIT and B-CIT. Very clear set of instructions. Shorter than other options. Some odors would only be valid in North American and related cultures**  [**http://www.healthmeasures.net/explore-measurement-systems/nih-toolbox/intro-to-nih-toolbox/sensation**](http://www.healthmeasures.net/explore-measurement-systems/nih-toolbox/intro-to-nih-toolbox/sensation) |
| 1. **The Brief Smell Identification Test (B-SIT)** | 5-minute screening test. The Brief Smell Identification Test (BSIT) is a commonly used measure of olfactory functioning in elderly populations.  <https://sensonics.com/>  For norms and cross-cultural considerations, see: (Menon, Westervelt, Jahn, Dressel, & O'Bryant, 2013) |
| 1. **Thomas Hummel's 'sniffin-sticks' test** | (~US130) <https://www.burghart-mt.de/en/medical-devices/sniffin-sticks-taste-strips/single-tests.html> (Hummel, Sekinger, Wolf, Pauli, & Kobal, 1997; Oleszkiewicz, Schriever, Croy, Hähner, & Hummel, 2019)  Manufactured in Germany; cost effective  The “Sniffin’ Sticks” test is a widely used tool for assessment of olfactory performance consisting of three subtests: olfactory threshold, odor discrimination and odor identification. It was introduced over 20 years ago by Kobal et al. 1996 Since the first publication, test–retest reliability and validity have been established and the test has been adapted in some cultures. Both extended and abridged versions with satisfactory psychometric properties have been proposed, along with modifications of the set of odors utilized.  Norms in 9139 subjects [4928 females aged 5–96 years (*M* = 31.8, SD = 18.9) and 4211 males aged 5–91 years (*M* = 30.7, SD = 17.7)].  Cross-cultural considerations: see (Millar Vernetti, Rossi, Cerquetti, Perez Lloret, & Merello, 2015) |
| 1. **University of Pennsylvania Smell Identification Test (UPSIT)** | ~ $27 USD per assessment <https://www.parinc.com/Products/Pkey/415>  One of the most common smell identification tests to assess olfactory function. It has now been translated into several languages and employed widely due to its accurate and appropriate ability to test olfactory function with no need for complex equipment and devices. However, the identification of different odors even in a normal population is strongly affected by various social and cultural factors, and it is suggested that the test be modified to prevent cultural biases (Altundag et al., 2015). |
| Objective Taste testing | |
| 1. **NIH Toolbox taste test (Coldwell et al., 2013)** | <http://www.healthmeasures.net/explore-measurement-systems/nih-toolbox/intro-to-nih-toolbox/sensation> |

*NB:*

Priority selection was based on how rapidly a tool covered the domain to be measured first and the international availability second.

**Supplemental Material 2: HL2: Computerized neurocognitive testing options with recommended coverage of Attention/working memory, Executive function, Motor function, Processing speed, and Learning and memory.**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Test My Brain** | **Cogstate** | **NeuroScreen** | **NIH Toolbox** |
| Tasks | Simple, complex RT, TMT, Digit symbol matching, Visual Paired associate, Grad CPT (more tasks are available to match cognitive domains assessed with other batteries) | Detection, identification, 1-back, 1-card learning (more tasks are available to match cognitive domains assessed with other batteries) | Verbal list learning/delayed, Number span forward/backward, Number span speed, Visual Discrimination, Trail Making Test, Finger tapping task | Flanker Inhibitory Control and Attention; Picture Sequence Memory; List Sorting Working Memory; Dimensional Change Card Sort; Pattern Comparison Processing Speed Test |
| Cost | Cost free if using main TMB platform  $US2500-$40,000 for customization | ~US$3000/year for academic research (waiver is possible for LMIC) | Cost to add audio files is USD $500 set-up fee  + USD$500 annual licence | ~US$500/year (iPad) |
| Cross-cultural validity | US, China, Spanish speaking population | International | US, South Africa, Thailand, Uganda, Zimbabwe, Kenya | Across US |
| Languages | English, Spanish, Mandarin | 60 languages + 30 in development; contact Cogstate for details | English (American and South African accent), Spanish (Mexican American), Zulu, Xhosa, Shona, Luganda, Thai, Swahili | English, Mandarin |
| Cross-sectional Norms  Longitudinal norms | Worldwide test user, large set of norms for each test (N=5000-10,000)  Age range: 10-89  Yes, upon request | Age; gender  International, large sample (N=800)  Education on request  Age range: 10-99 (upon request for 4-9)  Yes, at multiple intervals | Age; education; gender, ethnicity for US, and SA  Norming work is ongoing  Age range: 18-60  No | Age; education; gender, ethnicity (based on US representation)  Age range: 3-85  Yes, at one interval |
| Data access | Yes | Yes | Yes | Yes |
| Resource-limited setting validation | No | Yes | Yes | No |
| Platform | Online internet | Offline iPad or PC tablet or computer  Online internet | On or Offline Android tablet (cannot be used on iPad at this time) | Offline iPad |
| Interface friendly | Test demonstrations are on the webpage and see link below | Examiner supervision is gold standard  Online version is recommended only in non-clinical population | Has been used successfully by community health workers with about 3-4 hours of training | Testing procedures were designed to be done with an examiner |
| Instructions  Manual | Excellent, on screen only | Excellent + downloadable manual | Excellent, + video training available | Excellent and detailed |
| Administration | Self-administration is the default | Platform already exists via internet but at extra cost | Possible on most tests | Requires an examiner |
| Pros & Cons | Open science platform  Works on almost any device (although a single device is recommended for research)  Some tests are *not* cross-culturally adaptable  TMB welcomes translations as long as they are then made available to the platform  Quite a few tests are only for Latin alphabet-based languages | Widely used and validated but with varying concurrent validity compared to standard NP testing  Norms can be an issue if education is not accounted for  Some tests have a universal intake  Data is managed on a datapoint system which eventually remains with Cogstate  Translation to new language is possible in collaboration with Cogstate | Validation and use against standard NP testing in resource-limited setting (South Africa, Thailand, Uganda, New York)  Data synced to NeuroScreen server.  Currently very limited norms, however with a control group tests have demonstrated robust effect sizes to detect differences between HIV+ and HIV- groups. | Toolbox was developed to have concurrent validity with standard NP testing. The toolbox has the most sophisticated set of norms (for US only)  Some tests remain culturally North American & adaptation is a lengthy/costly process  Picture Vocabulary Test is very difficult and not possible in very low educated people  Has co-normed supplemental measures: Auditory Verbal Learning Test (Rey) & Oral Symbol Digit Test |

LMIC: Low-Middle Income Countries; NP: Neuropsychological; RT: reaction time; TMT: Trail Making Test

|  |
| --- |
| *Link to the computerized tools and key articles*: |
| Test My Brain: <https://www.testmybrain.org/>; <https://journals.plos.org/plosone/article/file?id=10.1371/journal.pone.0165100&type=printable>; <https://testmybrain.org/RDOC_Report/index.html> |
| Cogstate: <https://www.cogstate.com/academic-research/>; <https://www.cogstate.com/publications/tag/normsnormative-studies/> |
| NeuroScreen: <https://www.ncbi.nlm.nih.gov/pubmed/29305338> |
| NIH Toolbox (Cognition): <http://www.healthmeasures.net/explore-measurement-systems/nih-toolbox/intro-to-nih-toolbox/cognition>; <https://pubmed.ncbi.nlm.nih.gov/23479546/?from_term=NIH+Toolbox+cognition&from_pos=1> |

We recommend covering literacy, quality of education, and/or premorbid abilities to best interpret the neurocognitive test performance in addition to the use of the normative data.

*Suggested instruments:*

* WRAT-Reading or WTAR (English and other language versions)
* WAT-Chicago version (Spanish)
* Test My Brain Vocabulary (English, similarities-like test)
* WAIS (various versions) Vocabulary (English and other language versions)
* NART 2nd edition (English and other languages versions)
* Test of Premorbid Functioning (TOPF)
* Options for lower educated people: Spot the Word Test (SCOLP)

We also recommend the inclusion of performance validity tests at this level of harmonization: see **Supplemental Material 5** for further guidance. Note that some computerized test battery integrity data (e.g., Cogstate may serve as performance validity screen).

**Supplemental Material 2: HL2: Psycho-social and global health recommended 5 priority domains and priority instruments**

|  |
| --- |
| 1. **Depressive symptoms**  * **DASS** [**http://www2.psy.unsw.edu.au/dass/**](http://www2.psy.unsw.edu.au/dass/) **Note that DASS includes assessment of Anxiety and also Stress.** * Or PHQ-9 <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1495268/> * Or BDI-II <https://onlinelibrary.wiley.com/doi/full/10.1002/acr.20556> * Or CES-D <https://www.apa.org/pi/about/publications/caregivers/practice-settings/assessment/tools/depression-scale> * Or HADS (D) <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC183845/>   (+ semi-structured psychiatric interview + assess whether recent bereavement due to COVID-19 + type of relationship to deceased person) |
| 1. **Anxiety symptoms**  * And GAD-7 <https://jamanetwork.com/journals/jamainternalmedicine/fullarticle/410326> * Or BAI <https://www.gphealth.org/media/1087/anxiety.pdf> * Or HAM-A <https://dcf.psychiatry.ufl.edu/files/2011/05/HAMILTON-ANXIETY.pdf> * Or HADS (A) <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC183845/> |
| 1. **Fatigue**  * **And BFQ Brief Fatigue Questionnaire** [**https://www.mdanderson.org/research/departments-labs-institutes/departments-divisions/symptom-research/symptom-assessment-tools/brief-fatigue-inventory.html**](https://www.mdanderson.org/research/departments-labs-institutes/departments-divisions/symptom-research/symptom-assessment-tools/brief-fatigue-inventory.html)**;** [**https://www.sralab.org/sites/default/files/2017-07/brief\_fatigue\_inventory.pdf**](https://www.sralab.org/sites/default/files/2017-07/brief_fatigue_inventory.pdf) * Or Mental fatigue inventory <https://pubmed.ncbi.nlm.nih.gov/7636775/> |
| 1. **PTSD**  * **And CAPS-5** [**https://www.apa.org/ptsd-guideline/assessment/**](https://www.apa.org/ptsd-guideline/assessment/) * Or PCL-5 <https://www.ptsd.va.gov/professional/assessment/adult-sr/ptsd-checklist.asp> * Or PC-PTSD-5 <https://www.ptsd.va.gov/professional/assessment/documents/pc-ptsd5-screen.pdf> |
| 1. **Everyday activity**  * Instrumental Activities of Daily Living Scale (IADL)   <https://www.yumpu.com/en/document/read/51823007/instrumental-activities-of-daily-living-scale-iadl-internet-stroke-center> |
|  |
| **Below are additional domains that may be also tested** |
| Alcohol use   * And AUDIT <http://nceta.flinders.edu.au/files/3314/2257/4957/Right_Mix_3.pdf> * Or ASSIST (WHO) <https://www.who.int/management-of-substance-use/assist> |
| Substance use   * And DAST-10 <http://ehhapp.org/uploads/DAST-10-English.pdf> * Or ASSIST (WHO) <https://www.who.int/management-of-substance-use/assist> * Or DUDIT <https://paihdelinkki.fi/sites/default/files/duditmanual.pdf> |
| Stigma   * And SSCI-8 (8 items) <https://pubmed.ncbi.nlm.nih.gov/22639392/> * Or Full version SSCI <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3758464/> |
| Social support   * And MOSS-SSS-6 (short form) <https://www.ncbi.nlm.nih.gov/pubmed/24962651> * Or MOS-SSS |
| Loneliness   * And The UCLA (3-Item) Loneliness Scale <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2394670/> * Or The De Jong Gierveld short scales for emotional and social loneliness <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2921057/> |
| Global health   * And The MOS 36-Item Short-Form Health Survey (SF-36) <https://www.rand.org/health-care/surveys_tools/mos/36-item-short-form/survey-instrument.html> |
| Quality of life   * And WHOQOL-BREF <https://www.who.int/substance_abuse/research_tools/whoqolbref/en/> * Or SF-36 <https://www.rand.org/health-care/surveys_tools/mos/36-item-short-form.html> |
| Sleep questionnaire   * And 4 sleep items (1-4) of the IDS-SR <https://ebbp.org/resources/IDS-SR%20English.pdf> |
| Caregiver strain   * And Caregiver strain index <http://www.npcrc.org/files/news/caregiver_strain_index.pdf> |
| Discrimination   * And Everyday Discrimination Scale <https://scholar.harvard.edu/files/davidrwilliams/files/measuring_discrimination_resource_june_2016.pdf> |
| Pandemic Stress Index   * And [Harkness, A. (2020). *The Pandemic Stress Index*. University of Miami](https://clelandcm.github.io/COVID19-Interview-Items/COVID-Items.html?fbclid=IwAR2GpOauAKRhlqUuVuUfReF1FvNzPHD2AYzVUNa3RLrYloNe1CZ2AIW9EbU#harkness-a.-2020.-the-pandemic-stress-index.-university-of-miami) |
| Physical activity   * And Short form of the International Physical Activity Questionnaire – IPAQ <http://www.sdp.univ.fvg.it/sites/default/files/IPAQ_English_self-admin_short.pdf> |
| Pain   * And Indiana Polyclinic Combined Pain Scale   <https://www.practicalpainmanagement.com/sites/default/files/chapter4a-table1.pdf> |
| TBI screen   * And T-B-I Screening   <https://www.brainline.org/sites/default/files/TBI-Screening_v2.pdf> |

Priority selection was based on how a tool was available internationally and how rapidly it covered the domain to be measured.

*NB*: For HL2, we advise to cover at least: depressive and anxiety symptoms, fatigue and PTSD. Ideally knowledge on participant/client alcohol and substance use would also be assessed at HL2, but they should certainly be assessed at HL3. The tools have been selected based on their extensive use and validation across the world and in different clinical populations. Effort was made to select tools which have valid adapted/translated versions in several languages. The links provided will assist researchers/clinicians in further exploring and selecting the tools that will be best for their context and study population/clients.

*NB*: we strongly recommend that investigators always check if the recommended tools are either free online and in the public domain or whether materials should be obtained from accredited publishers.

**Supplemental Material 3: HL3: Other demographic characteristics to consider**

|  |
| --- |
| Education |
| Gender identity |
| Handedness |
| Country of birth |
| Country of residence |
| Which town or city do you live in? |
| Postcode |
| Rural/urban living |
| Native language |
| 2nd language |
| 3rd language |
| 4th language |
| 5th language |
| Primary language spoken at home |
| Housing conditions |
| Confinement rules (country/state/region) |
| Employment status before, during, after confinement |
| Occupation (+drop menu) |
| SES (Hollingshead or Duncan’s SEI); annual income |
| Partnership status (+ drop menu) |
| Level of social isolation/support during confinement |
| Level of help needed/received during confinement |
| Acculturation\* |
| Bilingualism\* |
| Literacy/quality of education |

\* Acculturation

Abbreviated Multidimensional Acculturation Scale (Zea et al., 2003: https://pubmed.ncbi.nlm.nih.gov/12760324/)

\*Bilingualism

* Use Animal fluency and conduct assessment in native and second language for a bilingual ratio

**Supplemental Material 3: HL3: Standard Neuropsychological Test Battery with recommended priority**

|  |  |
| --- | --- |
| **Cognitive domains** | **Standard Neuropsychological Tests** |
| Visuospatial learning & memory | **Brief Visuospatial Memory Test - Revised (BVMT-R)**\* |
| Verbal learning & memory | **Hopkins Verbal Learning Test (HVLT-R)**\*  Or Rey Auditory Verbal Learning Test (RAVLT)\*  Or WMS (various versions) word-list subtest  Or Hong Kong List Learning Test (HKLLT)  Or California Verbal Learning Test (CVLT)\* |
| Motor function | **9-hole pegboard test (NIH Toolbox)**  Or Grooved Pegboard Test  Or/And Finger Tapping Test (Neuroscreen or another computerized platform are advised) |
| Executive functions | **Color Trails Test 2\***  Or Trail Making Test B (only for Latin-based alphabet languages)  Or/And Stroop Color Word Interference Test  And Wisconsin Card-Sorting Test (WCST-64) (only in secondary educated persons) |
| Attention/working memory | **WAIS (various version) Digit Span (Forward and Backward)**  Or/And WAIS-III Spatial Span  Or /And WAIS (various versions) Letter/Number Sequencing (only for Latin-based alphabet languages) |
| Speed of information processing | **Color Trails Test 1\***  Or Trail Making Test A (only for Latin-based alphabet languages)  Or/And Symbol Digit Modalities Test (SDMT) (oral and written versions available)  Or/And WAIS (various versions) Digit Symbol Coding  Or/And WAIS (various versions) Symbol Search |
| Generativity | **Semantic Fluency (Animals)**  And Action Fluency  Or Letter Fluency (only for Latin-based alphabet languages)\* |
| Gnosis | **Include a brief Naming test from the:**  Boston Diagnostic Aphasia Examination (BDAE) subtests  Or Western Aphasia Battery (WAB) subtests  Or Apraxia Battery for Adults (ABA-2) subtests |
| Praxis | **Copy of the Rey or Taylor figure**  Or copy of 3 simpler figures (ADAS Cog-subtest)  Or/And Apraxia Battery for Adults (ABA-2) non-language subtests |
| Performance validity test | See Supplemental Material 5 |
| Prospective Memory | See further details in Notes and Matchanova et al., 2020 |

*Notes*.

The priority selection is based on international availability, ease of translation/adaptation, availability of norms and provision of longitudinal normative data. Longitudinal normative data provides data on practice effects, test-retest reliability and sometimes methods to compute standard change scores.

One test per domain is the minimum recommended which is the 1st listed test in each domain, one or two additional tests can be included in some domains for more extensive assessments. The coverage of all the included domains is strongly recommended for harmonization at least at the cognitive domains’ level.

Longitudinal normative data are available for all the selected tests published either by the test providers or in independent research samples. However, the cross-cultural representation of these norms is lacking. Some of the selected tests have alternate versions (as marked by an asterisk\*) which can minimize practice effects. We strongly advise using alternate versions when available. In any case, appropriate corrections for practice effect and test-reliability is strongly recommended. In the absence of appropriate normative longitudinal data, we recommend collecting exactly the same tests version with the same administration mode (face to face, online) at exactly the same test-retest interval in a demographically-comparable control group and extract the practice effect and test retest reliability from this. The same method can be applied to group analyses using linear mixed effect model, for example.

The recommended standard tests should be obtained from accredited test providers per relevant qualifications

For Wechsler Adult Intelligence Scale (WAIS) and Wechsler Memory Scale (WMS), various versions may be considered depending on languages and versions availability in each country

Pencil and paper versions exist for all these tests, however, note that test providers are increasingly developing computerized/tablet versions.

The stand-alone Repeatable Battery for the Assessment of Neuropsychological Status (RBANS) could also be considered as an alternative because it has been translated into 60+ languages. The RBANS also has longitudinal norms.

Prospective Memory can be tested using this recently developed telehealth neuropsychological test battery protocol which includes prospective memory tests. These tests can also be conducted face to face. Matchanova, A., Babicz, M. A., Medina, L. D., Rahman, S., Johnson, B., Thompson, J. L., Beltran-Najera, I., Brooks, J., Sullivan, K. L., Walker, R. L., Podell, K., & Woods, S. P. (2020). Latent Structure of a Brief Clinical Battery of Neuropsychological Tests Administered In-Home Via Telephone. *Arch Clin Neuropsychol*. https://doi.org/10.1093/arclin/acaa111

**Supplemental Material 4: Summary of professional practice guidelines for remote assessment and telehealth in neuropsychology**

· Confidentiality and data security are paramount, and practitioners must continue to abide by legal requirements in their country when selecting and using communication platforms;

· Practitioners are responsible for ensuring that their own knowledge and skills are sufficiently up-to-date to allow competent use of technology in clinical practice;

· Consent procedures must be adapted to acknowledge variations in practice compared with in-person contact, including the possibility that clinical decisions may differ from those that would have been made using in-person assessments (this should also be acknowledged in written reports);

· Practitioners should take account of the loss of contextual information, e.g., non-verbal cues and nuances of speech;

· Remote assessment may not be the right choice for some patients: it may be suboptimal or unsuitable for older people and children, people with learning disability, and people with limited technological experience;

· The challenges of linguistic and cultural diversity are especially important in remote assessment, and usual practices such as the use of interpreters may not be feasible or desirable;

· The physical environment (on both sides) needs careful consideration, including interruptions, distractions, and the possibility of interference or coaching from others;

· It may be possible to ask someone to accompany the patient in order to assist with test administration (e.g., where test materials have been sent out in advance), but this must be weighed carefully against the risks to test validity and security of copyright materials.

**Supplemental Material 5: Performance Validity Tests with consideration for cross culture use**

Considering the breadth of people that are infected with COVID-19, and to improve the validity of research results across studies, we recommend that researchers (and clinicians) consider including measures of performance and symptom validity (PVT, SVT). The measures are designed to identify potential response bias and thus improve the interpretability of test data (e.g., Sweet et al., 2021). There are numerous methods for determining performance and symptom validity. Some tests like the The Minnesota Multiphasic Personality Inventory (MMPI) contain validity indices to detect under- or over-reporting of psychiatric symptoms. Others are “stand-alone” symptom or performance validity tests like the Test of Memory Malingering (TOMM; Tombaugh, 1996) or the Structured Inventory of Malingered Symptoms (SIM; Smith & Burger, 1997).

We recommend the inclusion of PVTs and SVTs at harmonization level 2 and level 3. However, a significant challenge is selecting a measure that can be used internationally, across many languages and cultures. Most of the measures have been developed in the U.S. and Western Europe. Recent reviews show that misclassification can occur when these tests are used with non-English speakers (e.g., Correa, 2018; Erdodi et al., 2017; Nijdam-Jones & Rosenfeld, 2017).

There are several performance validity tests that show promise for cross-cultural assessments. The Coin in Hand–Extended Version (Daugherty, Hidalgo, Ruzzante, & Pérez-García, 2017) which was adapted from Kapur (1994), is an open-source test administered on tablets and personal computers. Several researchers found that with normative adjustments, some common PVTs such as the TOMM, Victoria Symptom Validity Test, b test, Dot Counting Test, and Rey Word test performed satisfactorily in Spanish-speaking samples, including those with low education (Rivera et al., 2015a; Robles et al., 2015; Vilar-Lopez et al., 2007). There are other examples of PVTs adapted to other cultures and languages (e.g., Chan et al., 2020; Weiss & Rosenfeld, 2010). As for other standard neuropsychological tests, we recommend that researchers collect control data in a culturally and demographically comparable group when no previous normative data are available for their study population. Selection of the most appropriate tests for the study population should follow our guidelines in the cross-cultural and disparities issues section.

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**Supplemental Material 6: Repeated Neuropsychological testing**

A detailed overview of issues associated with repeated neuropsychological testing is beyond the scope of the current recommendations. Below we provided, basic guidance and further reading.

Key concepts to be aware of include test-retest reliability, regression towards the mean (Duff 2012), and practice effects (Calamia, Markon, & Tranel, 2012). Methods to determine cognitive functioning change at the individual level should be considered as best practice (reliable change index, standard-regression-based change score, including more novel linear mixed effect model change score methods (for an overview see, Duff 2012, Cysique, Cassaleto and Heaton, 2019). Statistical methods to compare groups over-time should also be considered as best longitudinal analysis practice, and we recommend working with experienced statisticians in such models (e.g., linear mixed effect model, general equation estimate). Practice effects can be minimized with the use of alternate versions of the same tests, but correction for practice effects is often nevertheless needed (Calamia, Markon, & Tranel, 2012). With this in mind, we have selected, as best as possible, cognitive screening tools, computerized test batteries and neuropsychological tests that have alternate forms (see supplemental files for details). In the absence of longitudinal normative data, we recommend determining the extent of practice effects and test-retest reliability from a local and demographically comparable normative control group tested at the same time as the patient group and using the same mode of administration (face to face or online, see: Bilder et al.; Postal et al., 2020 for further consideration on this topic). Importantly, cognitive screens are not exempt from practice effects. At harmonization level 1, the total MoCA or the BTACT (which offers four versions) should be corrected for practice effects when used repeatedly. At harmonization level 2, we note that the Cogstate computerized battery was specifically designed for serial testing. It minimizes practice effects and has good test-retest reliability on its overall score. The NIH toolbox also has longitudinal normative data.

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