Chapter 6
Cognitive assessments

Serge Gauthier

Key points

- Cognitive assessments are required for the diagnosis of dementia and to track changes over time.
- The cognitive screening tests most used by clinicians are the Mini Mental State Examination (MMSE) and the Montreal Cognitive Assessment (MoCA).
- Complementary cognitive tests may be required based on symptoms.
- Tests that overcome the influence of language differences are needed, such as the Visual Cognitive Assessment Test (VCAT).
- As a result of the COVID-19 pandemic, many clinicians have incorporated telemedicine into their practice.
- As with in-person assessment, telemedicine encounters require the protection of patient privacy and confidentiality.
- The clinician must be aware of telemedicine limitations and decide whether an in-person encounter is necessary.
- For telemedicine assessments, carers are often required to facilitate the visit.

This is a chapter of the *World Alzheimer Report 2021, Journey to a Diagnosis of Dementia* which can be accessed in full at: https://www.alzint.org/resource/world-alzheimer-report-2021/

General background

Cognitive assessment is most often conducted with well-established tests in use for many years and familiar to clinicians. Noteworthy are the Mini Mental State Examination (MMSE) developed by Folstein et al. in 1975 (1), and the Montreal Cognitive Assessment (MoCA) developed by Nasreddine et al. in 2005 (2). Implementation of these screening tests was confirmed by the clinician survey appearing below. These tests were developed in Western populations with English as the primary language and a minimal grade 7 educational requirement, thus limiting their use in other world populations, as discussed by Ng et al. in their essay. Newly identified factors restricting use include copyright issues and the request for payment to either use the test or obtain training to administer it. Another key factor that was recently propelled to the forefront is the fact that these tests were developed for in-person testing. The COVID-19 pandemic impeded people living with dementia from visiting their healthcare professional. Fortunately, many clinicians adapted and incorporated remote telemedicine into their practice as described by Geddes et al. (3). Surveyed clinicians responded positively to the implementation of remote assessments.

Survey results

1,111 multidisciplinary clinicians responded to this survey and indicated that they routinely use the Mini Mental Sate Examination (81%), and the Montreal Cognitive Assessment (61%) with people concerned about their cognition. Many also use short screening tools such as the Five-word test (11%) and the Mini-Cog (11%). A significant number of additional cognitive tests are also used (31%). When special circumstances require it, such as a person with pre-existing intellectual disabilities that impede the use of standard cognitive tests, most clinicians will rely on functional decline and behavioural symptoms as indicators of dementia (54%) while many will use shorter versions of the MMSE or other commonly used cognitive tests (38%) and others switch to special scales for that individual (20%). In many instances, they refer to a neuropsychologist (38%) or a clinician with experience in such cases (21%). Based on the experienced gained from the COVID-19 pandemic, most clinicians responded favourably to using remote cognitive assessments in their practice for people previously diagnosed and in need of follow-up (52%) and for people living with dementia who could not attend an in-person consultation (63%). This may help to alleviate geographical healthcare inequalities and provide support for those living in rural communities in the future.

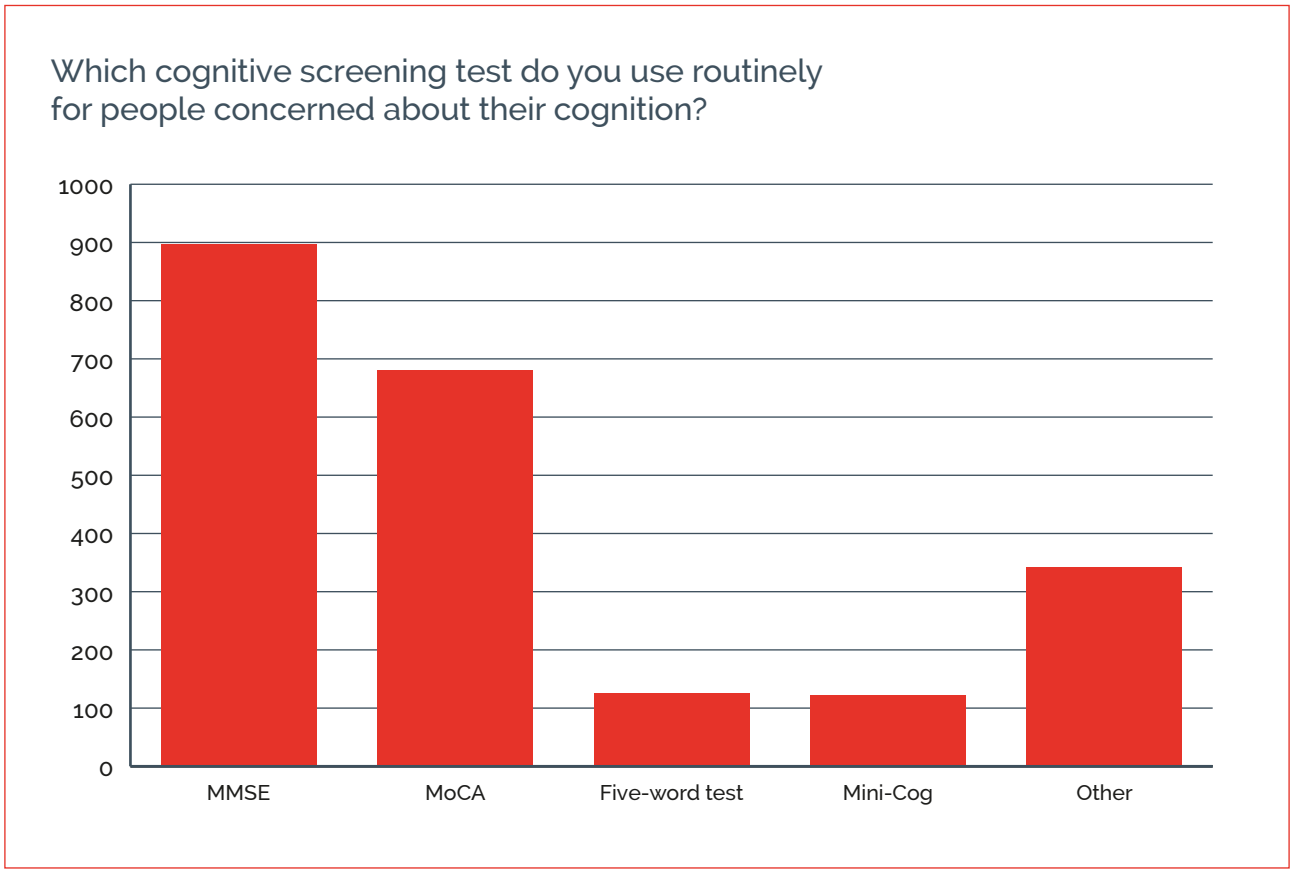

Chart 1. Clinician responses (multiple answers selected).

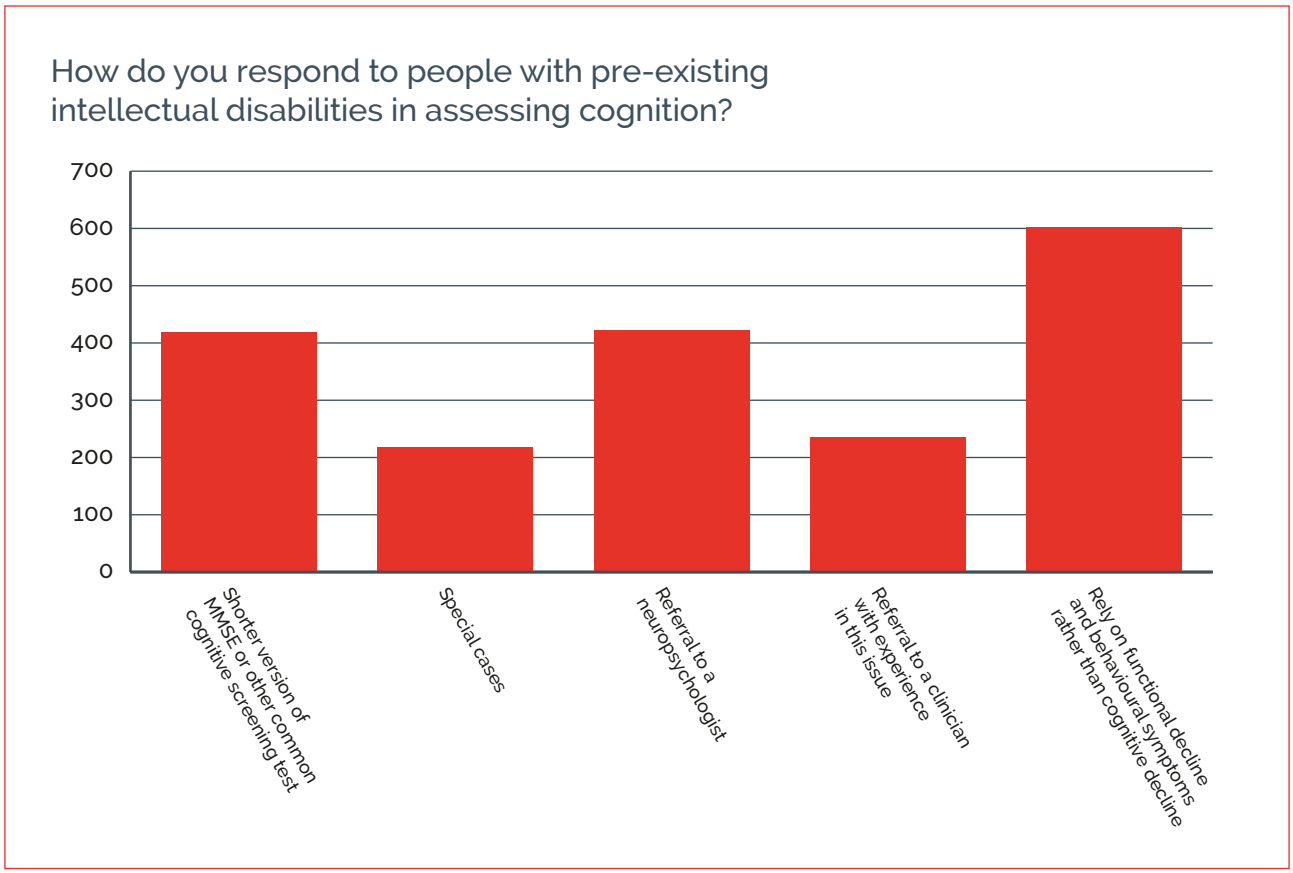

Chart 2. Clinician responses (multiple answers selected).

Expert essay

Remote cognitive assessment: guiding principles and future directions

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Systematic assessment of cognition represents a vital component of the evaluation of known or suspected cognitive decline associated with neurodegenerative conditions. These assessments range from brief cognitive screening tasks to comprehensive neuropsychological evaluations characterising a variety of cognitive domains. Assessment is required to establish, confirm, or rule out diagnoses, distinguish amongst disorders, and track cognitive changes over time and with treatment. The COVID-19 pandemic catalysed a rapid embrace of telemedicine that has been particularly important for vulnerable older adults. Despite challenges, current literature and practice support implementation of remote cognitive evaluation. Here, we provide guiding principles on remote assessment of cognition.

Current practice

It is critical to adopt strategies that minimise the burden of people with dementia and their carers while maximising safety and the value of collected information.

The same clinical and ethical standards apply to both in-person and telemedicine encounters. The interests and welfare of the person with dementia are of primary concern and clinicians must be transparent in disclosing the rationale for and limitations of remote care, including issues related to confidentiality and data acquisition/interpretation. As guidelines for implied consent in telemedicine are not yet defined, it is critical to obtain informed verbal consent and verification of the person's identity. Protection of personal privacy and confidentiality requires encrypted, password-protected videoconferencing software that is user-friendly and compatible across devices. A telephone number, as a back-up method of communication, should be obtained prior to the telemedicine encounter in the case of technical failures. Clinician empathy is critically associated with health outcomes and can be communicated with verbal and non-verbal techniques during the telemedicine encounter and further improved with clinician training. Disclosure of a diagnosis using telemedicine can be especially challenging and requires planning in advance to ensure this process supports people with dementia and their carers. Written summaries that include a management plan, educational materials and information about community resources enhance the continuity of care.

Strategies to improve the validity of remote assessment should be considered before, during and after the remote cognitive assessment

Independent historical corroboration with a collateral informant is an important component of cognitive assessment for people with known or suspected neurodegenerative conditions. For telemedicine assessments, carers may also be required to facilitate the visit. People with dementia and carers should be provided educational and technical resources beforehand to support the telemedicine encounter. To optimise the validity of the examination, clinician and home environments should be quiet, private, and free from distracting or orienting cues.

To fulfil competency of care in telemedicine, the clinician and person at home must be comfortable with technology. The clinician must take into account the limitations inherent to telemedicine and decide whether an in-person consultation is necessary. Clinicians should consider perceptual, language, educational, cultural, sociodemographic

and cognitive barriers to data collection and its fidelity and interpretability. This information should be considered in advance to determine whether there is an appropriate indication for a remote assessment. Validity of remote measurement requires adequate audio-visual quality, Internet connectivity speed and access to necessary visual and hearing aids for the person with dementia. Alternative modalities (for example, the telephone) should be offered to minimise obtrusiveness, if appropriate.

While cognitive screening can be completed by telephone, videoconferencing provides a more personal connection and allows for a neurobehavioural status examination and behavioural observations that cannot be made over the telephone. Videoconferencing also expands the repertoire of available tests and allows for the presentation of visual stimuli (for example, via screen sharing). Specialised brief screening tools designed for telephone administration have been developed and validated, while other widely-used cognitive screening tools have been adapted for telephone administration (1,2). However, we recommend the triangulation of data from the clinical interview, validated by brief remote testing (for example, cognitive screening, cognitive domain-specific tests, neuropsychiatric symptom, behavioural and function questionnaires) and videoconferenced neurobehavioural status examination when possible. Confidence in the clinical interpretation of cognitive assessment and diagnosis is increased when there is convergence across different sources of information.

Remote cognitive assessment is largely feasible and acceptable

Remote neuropsychological testing has been found to be feasible and acceptable when used for dementia diagnostic evaluations (3). Individual satisfaction with telemedicine assessment is high, including in those with cognitive impairment (4). Comparisons of remotely delivered versus in-person neuropsychological test administration in older persons with and without cognitive impairment have reported similar and highly correlated scores on a variety of standard tests (5–7). Thus, there is a growing evidence base for teleneuropsychology that supports the feasibility, validity, reliability, and acceptability of remote cognitive assessment. This should be integrated with the understanding that non-standardised test administration and the unknown impact of applying normative comparison standards gathered from in-person assessment may affect the interpretation of findings from remote cognitive assessments (8).

Future directions

Further work is needed to determine the validity, barriers and outcomes of remote cognitive assessment.

As with in-person assessment, it is critical that approaches to remote cognitive assessments are unbiased across race, ethnicity, educational attainment, language and sensorimotor abilities. Opportunities and future directions include validation of additional instruments in diverse cultural and linguistic populations, examination of in-home assessment effects, and development of new tools that capitalise on the virtual environment. The latter include response recording and scoring, computer-administered tests, and the use of mobile devices. Data gathered from wearable devices or remote sensor data may provide methods to monitor multiple aspects of physical and behavioural functioning, including sleep, movement and vital signs. Ultimately, these metrics may lead to the discovery of digital biomarkers earlier in the course of illness (9). Further development of open-source technological tools that assess visual fields, eye movements, hearing and subtle behavioural features such as task engagement, attention, and body language may enhance the remote neurobehavioural status examination. Harmonisation of metrics across platforms and best practice protocols will be required for appropriate use of these technologies.

Future work is required to maximise the safety of the person with dementia and the value of information gathered. Development of intuitive user interfaces will help to minimise the burden of remote cognitive assessment on them and their carers. Virtual design solutions will help to expand the repertoire of telemedicine-enabled cognitive assessments. The pandemic has highlighted the digital divide across demographic and socioeconomic groups which impacts the accessibility of telemedicine and places the burden of access on people with dementia and their families. Equitable access to remote cognitive assessment irrespective of disease stage and level of carer support is critical. Building health system infrastructures that support delivery of cognitive telemedicine at local community health service centres could improve access for those with limited social or technological resources.

The COVID-19 pandemic created challenges that catalysed a rapid adoption of telemedicine. Despite its inherent limitations, this expansion of telemedicine may improve access to diagnostic and supportive care of older patients with known or suspected neurodegenerative disorders and cognitive impairment, if applied judiciously. Telemedicine should not seek to replace or undermine the power and art of the in-person diagnostic evaluation. Rather, telemedicine is a tool that offers the potential to enhance neurobehavioural diagnostic capabilities and access to subspecialty care to better serve people with and their families. In addition to supporting cognitive assessment and clinical diagnosis, telemedicine may facilitate improved care through counselling, behaviour management, and rehabilitation. This presents an opportunity to innovate clinical practice beyond the current pandemic.

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Expert essay

Cognitive assessment for multilingual societies in Asia and globally

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Cognitive tests that measure both global and domain specific cognitive abilities such as memory, attention, visuospatial, language, and executive function play an important role in complementing the clinical history of individuals who present with cognitive symptoms to allow a timely and accurate diagnosis of mild cognitive impairment or dementia to be made. The Mini-Mental State Examination (MMSE) and Montreal Cognitive Assessment (MoCA) are examples of cognitive tests that are commonly used worldwide. However, many of these cognitive tests were established for monolingual Western populations (usually English) where they were first developed. Therefore, the diversity of languages and cultures worldwide poses a significant barrier in using them in their original language and form (1). This is especially relevant in regions of the world where the populations are often multilingual with numerous native dialects such as Asia. While there has been progress in the Indigenous development of original tests that are specific to regional Asian contexts over the past decades, more work has been dedicated to the translation and adaptation of existing tests (2,3), many of which are used in Asia for comparability and generalisability to existing research literature.

Translating existing cognitive tests to the multilingual Asian context has the advantage of being familiar and accessible as well as less time-consuming than developing new, original tests. Importantly, this enables the comparison of scores obtained from a common test between international and inter-cultural cohorts, although such comparisons may not allow for insights into culturally-specific differences. The substantial work done in translating and validating the Montreal Cognitive Assessment (4) test across many world centres and the efforts by the 10/66 Dementia Research Group (5) are examples that make well-established tests available in numerous languages, and therefore accessible and usable worldwide. On the other hand, there are several confounders when translating cognitive tests. Firstly, some languages/dialects do not have a well-defined or well-known writing system (for example, Hokkien; a dialect of Mandarin) and thus cannot be easily translated into a written format. Secondly, the process of translating cognitive tests introduces measurement error due to linguistic differences (such as differential item functioning) (6) and replacement of items that cannot be translated. Thirdly, cross-linguistic artefacts in translation and variation in administration or scoring procedures may cause method bias (7). Consequently, scores of translated and original versions of cognitive tests may not be comparable when executed in different linguistic groups of the same population and in multinational studies. Presently, there are only a few cognitive tests that have been developed and validated in Asia and a dearth of published validation studies in many Asian nations and languages (3). Therefore, a concerted effort to develop tools that overcome the influence of language differences by mitigating the need for translation is greatly warranted.

One such effort is the development of visual-based cognitive tests that are designed to overcome language barriers. For instance, the Cross-Cultural Dementia Screening (CCD) test was developed to overcome linguistic and cultural differences in the cognitive assessment of elderly immigrant populations in Europe (8). The CCD is a digital test that uses pictures of familiar, everyday objects to assess episodic memory, mental speed, and executive function. Psychometrically, it is found to outperform the MMSE in discriminating between normal controls from people with dementia. Method bias resulting from administrative or scoring variations is also reduced given that the test is administered by a computer. However, this test is only available in six languages (namely, Dutch, Turkish, Moroccan-Arabic, Tarifit, Sranantongo, and Sarnámi-Hindustani), none of which are commonly used in Asia. Similarly, while other visual-based tests have been developed by Western cohorts such as the Picture-Based Memory Impairment Screen for dementia and the Phototest, they are not widely used in Asia (3). Recognising this gap, the Visual Cognitive Assessment Test (VCAT) which uses pictures of familiar objects and scenes to assess episodic memory, visuospatial, executive function, language, and attention has recently been developed in Asia (9). The VCAT is demonstrated to be a reliable and effective screening for mild cognitive impairment and dementia and the construct validity and efficacy of the VCAT in comparison to the MMSE and MoCA have been previously reported, with the VCAT performing comparably to the MoCA and better than the MMSE in detecting cognitive impairment (10). A shortened version of the VCAT (the VCAT-S) has also been

developed and found to be comparable to the original test (11). More importantly, the VCAT can be administered in multilingual populations and has been validated in a multi-site study across centres in Southeast Asian (Singapore, Malaysia, Indonesia, and the Philippines(12)). Given this, the VCAT shows promise as a potential cross-linguistic tool and efforts to validate it in centres outside Asia, including Brazil, India, South Korea and Canada are underway. While the above efforts aim to address the issues linked to test translation in multilingual societies, it is important to note that other factors such as education, literacy rates, social-economic status, cultural norms and nation development/industrialisation will need to be accounted for as these play a significant role in influencing cognitive performance (13,14).

Future directions

There needs to be international efforts to form large multi-centre cohorts by pooling cognitive and biomarker data from institutions across the world to study the pathophysiology of neurocognitive diseases. Furthermore, clinical trials are increasingly globalised with the inclusion of international sites. Therefore, it is imperative to have a valid and reliable cognitive test with minimal influence from language differences that is comparable across multinational and multilingual populations. The recently developed visual-based language-neutral tools have shown promise in detecting cognitive impairment. However, further validation studies are needed before these tools can be applied internationally. In addition, there is a growing trend in adopting digital technology to conduct cognitive assessment in place of the traditional paper and pencil method, given the potential benefits of enhancing the efficiency of cognitive evaluations such as automatic scoring to reduce scoring errors (15). Digital technology enables the test to be performed remotely, which is especially important in the current COVID-19 pandemic given the limitation of in-person evaluations in a clinic setting. For visual-based tests, digital technology may eliminate administration/scoring bias by standardising the administration of the test in multiple languages. However, these benefits will need to be weighed against the challenges and potential pitfalls of digitalisation as elaborated in a recent review (15). With ageing of populations worldwide, digital-based, language-neutral cognitive evaluations will allow for harmonised clinical evaluations and meaningful international collaborations.

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Visual Cognitive Assessment Test (VCAT)

Memory (part 1) — **Total Score**

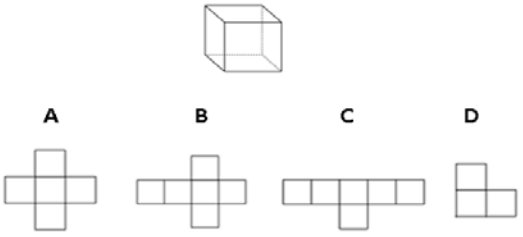
Scenario
Please look at the picture and (a) name the location and (b) name the items that you can see.
(Refer to picture page)

Dog	Coconut Tree	Kite	Crab	Lady	Bone

No marks

Visuospatial

(a) Cube
Which of the following option (A, B, C or D) when folded up will result in the figure below? Please circle one option.



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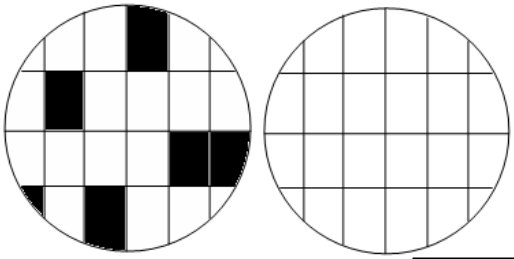
(b) Grid
Please copy the figure from on the left to the empty one on the right as fast as you can.



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***Refer to scoring table**

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Memory (part 2)

(a) Scenario
3 objects below were **NOT** present in the picture earlier. Please circle these three items.

1 point for EACH correct answer

/ 3

(b) Shapes
Please look at the shapes and try to remember as many elements as you can. You will be asked about this later.
(Refer to picture page)

No marks

Language

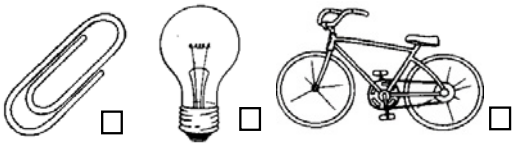
(a) Fluency
Please name as many vegetables as you can in 1 minute.

Total:

/ 2*

(b) Naming
Please name the items below.

1 point for EACH correct answer



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***Refer to scoring table**

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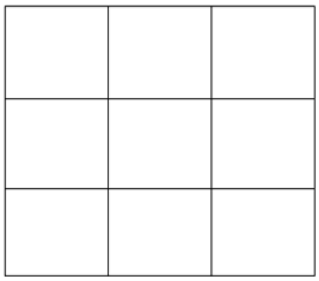
Memory (part 3)

(a) Shapes
You were showed you some shapes earlier. Please try to recall and fill in the boxes below with the shapes you saw.



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***Refer to scoring table**

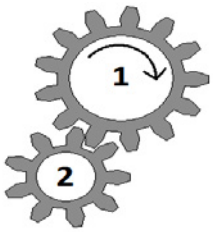
(b) Objects
Please name the objects. Repeat all of them twice and remember these FOUR objects. You will be asked about them later.
(Refer to picture page)

No marks

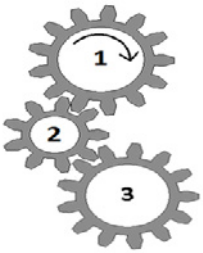
Executive Function

(a) Gears

(a) If Gear 1 is turning in the indicated direction, please draw the arrow in which will Gear **2** turn?



b) If Gear 1 turns in the indicated direction, in which direction will Gear **3** turn?



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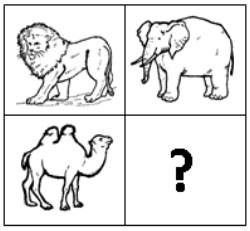
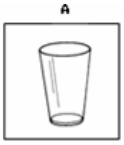
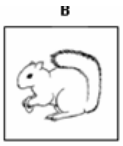
(b) Category

Which of the following options (A, B or C) is the best option to place inside the empty box? Please circle your option.







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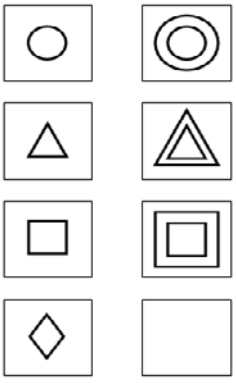
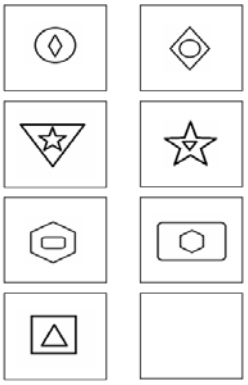
(c) Patterns

Take a look at the patterns below and fill in the empty boxes with the correct patterns.

1 point for EACH correct answer





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Memory (4)

Objects

You were showed four objects earlier. Can you recall what the four objects are?

	1	2	3	4	Score
Uncued (2 points)					
Cued (1 point)					

/ 8

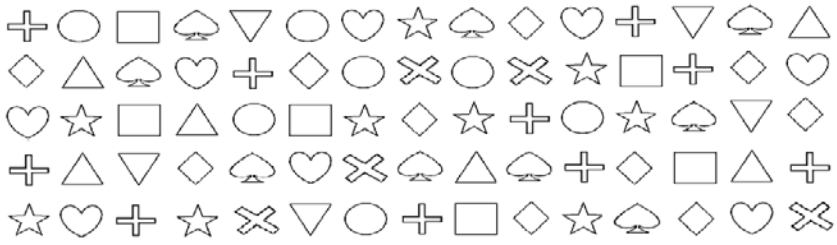
Total Memory (2)+(3)+(4)

___ / 13

Working memory/ Attention

Shape cancellation

Cancel the following shapes:  and  . You have 1 minute.



__ / 3*

*Refer to scoring table

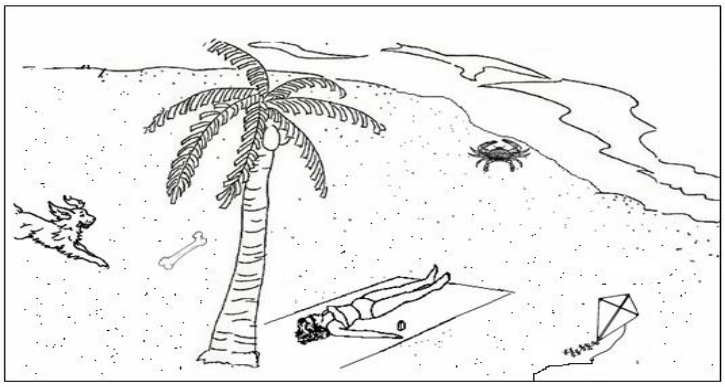
___ / 3

TOTAL SCORE:

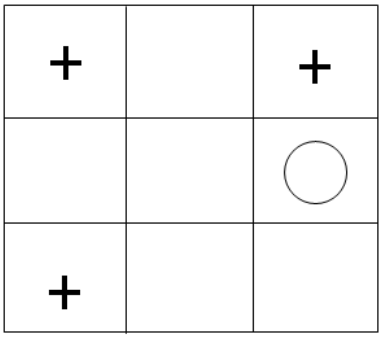
Visual Cognitive Assessment Test (VCAT)

Picture Page

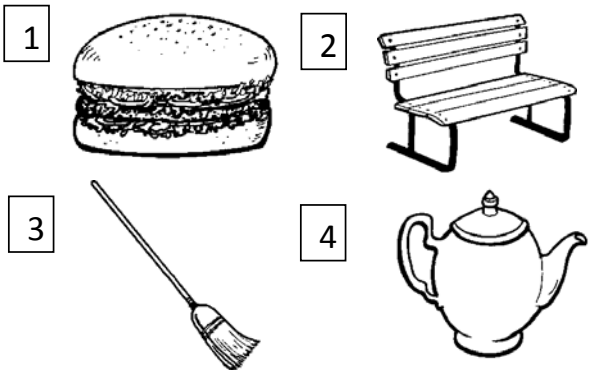
Memory: Scenario



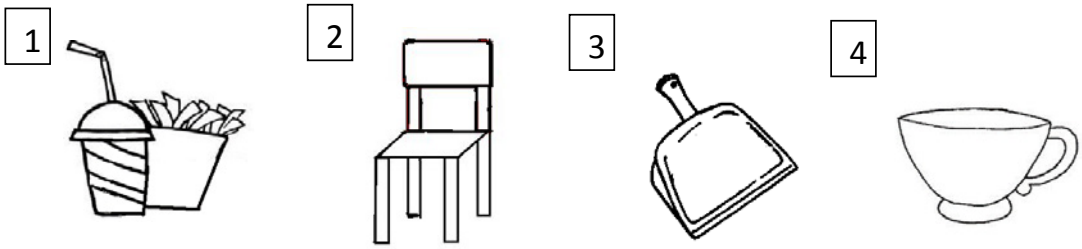
Memory: Shapes



Memory: Objects



Memory: Objects (Cues)



Scoring Table

Visuospatial: *Grid* In 30s, 0 – 3 correct boxes = 0 point 4 – 5 correct boxes = 1 point 6 (All) correct boxes = 2 points	*Memory: Shapes* 0 – 1 shape and position correct = 0 point 2 – 3 shape and position correct = 1 point 4 (All) shape and position correct = 2 points
	Executive function: Gears Both gears wrong = 0 point Either 1 of the gears correct = 1 point 2 gears correct = 3 points
Language: Fluency 8 – 10 vegetables = 1 point 11 or more vegetables = 2 points	*Attention/ Working Memory* 3 or more errors = 0 point 2 errors = 1 point 0 -1 error = 3 points

Expert essay

Language in normal ageing and dementia

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Older adults may consult their primary healthcare professional with atypical or unexpected cognitive symptoms. If not adequately acknowledged, there is a risk these will not be addressed in a timely manner. For example, acquired language deficits (aphasia) are frequently underestimated by the general practitioner who is typically more concerned by the individual's memory issues. However, word-finding concerns are among the most frequent complaints in the normal ageing population (1). While occasional verbal difficulties are common occurrences in the healthy ageing process and usually characterise as a benign phenomenon, progressive deficits in motor speech, language production and comprehension with a significant functional impact may represent symptomatic manifestations of specific neurodegenerative processes. In general, healthy ageing is associated with the preservation or even the expansion of vocabulary skills, even if lexical retrieval tends to be slower. Sentences are usually shorter and less grammatically complex. Oral production is characterised by frequent hesitations and fillers. There is an increased use of indefinite words, and the tip-of-the-tongue phenomenon is pervasive (2–3). In addition, other age-related confounding factors such as hearing and vision difficulties, medications, and multifactorial articulation inaccuracy could negatively affect verbal communication. Nevertheless, a significant halted, circumlocutory, not informative speech, with many pauses as well as sound and word transformations (paraphasias), is definitively abnormal, and deserves further investigation. In addition, while struggling to name a famous actor is generally not worrisome, forgetting the names of family members or common objects is very unusual. Moreover, progressive recurrent difficulties in following conversations, especially in the context of multiple speakers, or understanding a televised newscast could represent a verbal comprehension impairment.

Obviously, investigating how these aphasic symptoms began is essential to determine their underlying aetiology, (causes or origins), to correctly orientate clinical management. A sudden onset in a previously asymptomatic person is likely the manifestation of an acute cerebrovascular accident (stroke); a subacute progressive process could be due to a space-occupying brain lesion (tumours or abscesses), while more chronic, slowly progressive difficulties are generally related to neurodegenerative conditions (dementia).

It is worth noting that there is growing clinical evidence that specific language difficulties may be one of the most sensitive cognitive biomarkers of conversion in individuals with mild cognitive impairment (4) (namely semantic fluency and naming impairments) to Alzheimer's disease and in normal controls (5). Furthermore, besides Alzheimer's disease, language deficits are present in multiple dementia syndromes where word-finding impairment and some semantic decline are especially evident, but also in dementia with Lewy bodies, vascular dementia (lexical retrieval deficit), and corticobasal disease (motor speech impairment). Similarly, language disorders are the core clinical feature of primary progressive aphasias, a heterogeneous group of neurodegenerative diseases that affect an individual's ability to effectively communicate. In essence, this is a rare nervous system syndrome with symptoms manifesting distinctive language impairments in a gradually and progressively manner (6).

Generally, three major primary progressive aphasia variants are described in the literature, each one with a specific dysfunctional language profile (7).

Nonfluent-agrammatic variant (nfv-PPA): Characterised by a person's struggle to pronounce and get words out correctly, this apraxia of speech chiefly presents with sound distortions, slowed articulation or changes in prosody for articulatory complex words and/or agrammatism where telegraphic speech may be used with preserved word meaning.

Semantic variant (sv-PPA): Characterised by a pervasive decline in understanding the meaning of words, concepts and as well as naming familiar people, places or objects, this severe anomia presents with semantic paraphasias and preservation of motor speech and sentence repetition.

Logopenic variant (lvPPA): Characterised by an individual's increased difficulty in finding the words they want to use, this variant presents with hesitant verbal production, phonological paraphasias, and deficits in long sentence repetition due to phonological working memory difficulties. Word meaning and semantics are preserved.

It is imperative to accurately determine the abnormal language profile in a PPA individual as the three PPA variants represent different neurodegenerative diseases with distinct

neuropathological findings. nfvPPA is principally a tauopathy, sv-PPA is associated with TDP-43 type C pathology, and lv-PPA with Alzheimer's disease neuropathological changes (8). Implications for genetics analysis, disease progression, language and pharmacological therapies, access to clinical trials, are unique for the three variants.

It is thus crucial for primary healthcare providers to be sensitive to language concerns from individuals and their families and to be able to differentiate between normal age-related and pathological changes in verbal skills. Some simple tasks can be useful in identifying language deficits in symptomatic people: picture naming, word and sentence repetition, regular and irregular word spelling, verbal fluency, motor speech, and single word comprehension (semantics). In Canada, a quick screening tool that could be used during routine clinic visits to accurately assess language disorders in neurodegenerative diseases has recently been developed (9). Norms for the Detection Test for Language Impairments in Adults and the Aged (DTLA) were obtained from a sample of 545 healthy, community-dwelling, French-speaking adults from four French-speaking countries (Belgium, Canada (Quebec), France, and Switzerland). The translation and validation of the test in English and in other languages are currently ongoing.

The use of DTLA or other screening tools in a clinic setting has the potential to positively impact the early diagnosis of neurodegenerative disease in individuals, more particularly, those whose language is affected early on. Ultimately, the guiding principle here is to be able to fast-track both medical attention as well as access to services tailored to their individual circumstances.

Indeed, though there is currently no definitive cure for neurodegenerative aphasic syndromes, bear in mind that current multiple non-pharmacological approaches could dramatically improve an aphasic individual's quality of life, including, but not limited to, the adoption of alternative, non-verbal communication strategies, meditation for stress and anxiety reduction, participation in support groups and regular physical activity.

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Conclusions

Cognitive assessment has long relied on the enduring tests that most clinicians are accustomed to using as measurement tools. These include the Mini Mental State Examination (MMSE) and the Montreal Cognitive Assessment (MoCA). However, in this changing world, one that is experiencing both a growth in the ageing population and the wrath of a global pandemic, clinicians have had to adapt to these circumstances.

These well-established tests were developed in Western countries and employ in-person assessment with English as the primary language. These parameters limit their use in other countries as well as hinder vulnerable older adults living with dementia from visiting their healthcare professional because of imposed pandemic restrictions. Hence, the rapid introduction of telemedicine to remotely administer these assessments, an alternative that most clinicians favour.

While telemedicine has facilitated the implementation of remote cognitive evaluation, there exist certain constraints such as ensuring the collected information is based on informed verbal consent, safe digital environments, and respects the individual's confidentiality. Other barriers such as educational, cultural, sociodemographic considerations should factor into the decision to administer a test remotely.

While videoconferencing does allow for the presentation of visual stimuli or behavioural observations, unlike a consultation over the telephone, it is critical that any remote approach be unbiased across race, ethnicity, educational attainment, language and sensorimotor abilities. Equitable access to remote cognitive assessment irrespective of disease stage and level of carer support is critical. Therefore, there is a concerted effort underway to overcome language and cultural barriers with the development of new tests such as the Cross-Cultural Dementia Screening (CCD) test and the Visual Cognitive Assessment Test (VCAT). This brings to the forefront the idea that an international effort to form large multi-centre cohorts by pooling cognitive and biomarker data from institutions across the world to study the pathophysiology of neurocognitive diseases is needed.

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