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A validation study of the Integrated Cognitive Assessment (ICA)

Submission date	Recruitment status	[X] Prospectively registered
09/03/2018	No longer recruiting	[ ] Protocol
Registration date	**Overall study status**	[ ] Statistical analysis plan
26/03/2018	Completed	[ ] Results
Last Edited	**Condition category**	[ ] Individual participant data
15/06/2022	Mental and Behavioural Disorders	[ ] Record updated in last year

Plain English summary of protocol

Background and study aims
Neurodegenerative disorders, such as dementia and Alzheimer's disease, are incurable and debilitating conditions that result in progressive degeneration and/or death of nerve cells. They continue to represent a major economic, social and healthcare burden. The current methods of screening suffer from several drawbacks making them less effective for users and stakeholders, e.g. they are time consuming, costly, not sufficiently sensitive for early diagnosis, and dependent on education, language and demographic. Integrated Cognitive Assessment (ICA) is a computerised cognitive assessment tool based on image recognition and operating on the Apple iPad. It uses an artificial intelligence (AI) engine capable of improving its own sensitivity as the number of patients who complete the test increases and the AI engine is updated. ICA is distinctive as it does not rely on language or education while it is not subject to learning effects, i.e. patients cannot memorise it after repeated use. It does not require specialist clinicians and importantly its duration is short (5-6 min). The overall aim of this study is to assess the use of ICA to help frontline physicians in the detection of cognitive (thinking) impairment associated with disease, such as mild cognitive impairment (MCI) and Alzheimer's dementia (AD). ICA is compared with a widely used cognitive assessment test (Montreal Cognitive Assessment, MoCA) and specialist Memory Clinic diagnosis. The study also explores the use of ICA combined with cerebrospinal fluid (CSF) biomarkers for the diagnosis of MCI.

Who can participate?
Patients already diagnosed with mild Alzheimer's dementia or MCI, and healthy volunteers aged between 55 and 90

What does the study involve?
The study involves two phases. In Phase I the AI algorithm is trained. All participants undergo tests and scores from previous cognitive tests are taken from their records. During the Phase I visit the participants take the MoCA and ICA tests . In Phase II all participants are given the ICA test alongside the MoCA test, and scores from previous cognitive tests and CSF biomarker measurements are taken from their records if available. Test-rest reliability data is collected from a sample of participants tested about 2-4 weeks apart.

What are the possible benefits and risks of participating?
The outcome of this study is unknown, which is why the study is being done. However, the researchers are confident that through participation in this study participants will have the chance to learn more about their cognition. Whilst participants will be seen more often and may feel more supported as a consequence of their involvement, the most likely benefits from this study will be experienced by others in the future, if this test becomes part of standard care. As with any study there are potential risks participants should consider even though it is very unlikely they will experience any discomfort. It is possible but very unlikely that participants may become stressed or anxious while taking the ICA test. In the case the study will be immediately interrupted and consideration will be given on whether to terminate. It is also possible but extremely unlikely that participants experience fits (seizures) because the test contains slowly flashing images. In this case the test will be immediately stopped.

Where is the study run from?
South London & Maudsley NHS Foundation Trust (UK)

When is the study starting and how long is it expected to run for?
March 2018 to August 2021 (updated 18/06/2020, previously: January 2020)

Who is funding the study?
Cognetivity Limited (UK)

Who is the main contact?
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Contact information

Type(s)
Public

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Additional identifiers

Protocol serial number

CGN-1801

Study information

Scientific Title
A validation study of a computerised, artificial intelligence assisted cognitive assessment test compared to a widely used cognitive assessment test and specialist clinical diagnosis in patients with Alzheimer's dementia and mild cognitive impairment

Acronym
CGN-ICA

Study objectives
The trialists are validating the Integrated Cognitive Assessment (ICA), a 5-minute computerised cognitive assessment tool based on a rapid categorisation task. The test is software based, self-administered and independent of language and education. It is designed for use on an Apple iPad. The accuracy and speed of responses are then assessed using Artificial Intelligence to compare ICA tests previously taken by healthy and cognitively impaired individuals. This enables the ICA to provide an objective indication of cognitive performance and likelihood of impairment.

The trialists also aim to explore the relationship between the ICA and Cerebrospinal Fluid (CSF) biomarkers in patients with MCI (Mild Cognitive Impairment) i.e. low CSF Aβ42, elevated CSF tau or phosphorylated tau with a view to assessing potential combined predictive ability in MCI.

Ethics approval required
Old ethics approval format

Ethics approval(s)
Approved 10/05/2018 by London - Dulwich Research Ethics Committee, Health Research Authority, Skipton House, 80 London Road, London, SE1 6LH, Tel: +44 (0)20 7972 2561, Email: NRESCommittee.London-Dulwich@nhs.net, REC ref: 18/LO/0575

Study design
Interventional case-control single-centre study

Primary study design
Interventional

Study type(s)
Diagnostic

Health condition(s) or problem(s) studied
Mild Alzheimer's dementia, mild cognitive impairment

Interventions
Current interventions as of 05/03/2019:
The study involves two clinical phases:

In Phase I the trialists aim to train the Artificial Intelligence algorithm that will be incorporated into Phase II of the

study. In Phase I a minimum of 30 to a maximum of 48 patients already diagnosed with Mild Alzheimer's Dementia, a
minimum of 30 to a maximum of 48 patients with known MCI and a minimum of 30 to a maximum of 48 healthy
controls aged between 55 and 90 years will be recruited. Patients will be given the following assessments in all three
groups in a single visit. The assessments comprise of: ACE-III, BADLS, HADS, ICA, MoCA, medical history and a
record of sensory difficulties. Information on their medical history will be taken in accordance with the
inclusion/exclusion criteria of the study. The trialists will also seek to obtain information on scores from previous
cognitive assessments from patient records.. The sequence of the tests will be randomised.

In Phase II the trialists aim to recruit approximately 90 patients meeting the criteria described by the working group
formed by the National Institute of Neurological and Communicative Disorders and Stroke (NINCDS) and the
Alzheimer's Disease and Related Disorders Association (ADRDA) (referred to as the NINCDS-ADRDA criteria)
criteria for Mild Cognitive Impairment (MCI) and 90 patients meeting NINCDS-ADRDA criteria diagnostic criteria for
Mild Alzheimer's Disease (AD) against a control group of 90 healthy individuals (NC) aged between 55 and 90 years.
All trial participants in Phase II will be given the ICA test alongside the Montreal Cognitive Assessment (MoCA). The
sequence of the above tests will be alternated . The trialists will also seek to obtain information on scores from
previous cognitive assessments and information on CSF biomarker measurements, if available from patient records.
In Phase II, test-retest reliability data for the ICA will be collected from a sub-sample of 45 Phase II participants (15
patients from each group) tested approximately 2-4 weeks apart. The ICA and MoCA will be re-taken by participants
from MCI, AD and control groups over one visit and the sequence of testing will be alternated.

Previous interventions:
The study involves two clinical phases:

In Phase I the trialists aim to train the Artificial Intelligence algorithm that will be incorporated into Phase II of the study. In Phase I a minimum of 30 to a maximum of 50 patients already diagnosed with Mild Alzheimer's Dementia, a minimum of 30 to a maximum of 50 patients with known MCI and a minimum of 30 to a maximum of 50 healthy controls aged between 55 and 80 years will be recruited. After completing initial Screening Visit procedures, patients will be given the following assessment tests in all three groups: ACE-III, BADLS, HADS, medical history, record of sensory difficulties. Information on their medical history will be taken in accordance with the inclusion/exclusion criteria of the study. The trialists will also seek to obtain information on scores from previous cognitive assessments from patient records. At a second visit the patients will be given the MoCA and ICA tests. The sequence of the tests will be randomised.

In Phase II the trialists aim to recruit approximately 90 patients meeting the criteria described by the working group formed by the National Institute of Neurological and Communicative

Disorders and Stroke (NINCDS) and the Alzheimer's Disease and Related Disorders Association (ADRDA) (referred to as the NINCDS-ADRDA criteria) criteria for Mild Cognitive Impairment (MCI) and 90 patients meeting NINCDS-ADRDA criteria diagnostic criteria for Mild Alzheimer's Disease (AD) against a control group of 90 healthy individuals (NC) aged between 55 and 80 years. All trial participants in Phase II will be given the ICA test alongside the Montreal Cognitive Assessment (MoCA). The sequence of testing will be randomized. The sequence of visits for Phase II will be as in Phase I described above. The trialists will also seek to obtain information on scores from previous cognitive assessments and information on CSF biomarker measurements, if available from patient records. In Phase II, test-retest reliability data for the ICA will be collected from a sub-sample of 45 Phase II participants (15 patients from each group) tested approximately 2-4 weeks apart. The ICA and MoCA will be re-taken by participants from MCI, AD and control groups over one visit and the sequence of testing will be randomised.

Intervention Type
Other

Primary outcome(s)
1. Cognitive impairment is measured using the Integrated Cognitive Assessment (ICA) at 2 and 4 weeks
2. Cognitive impairment is measured using the Montreal Cognitive Assessment (MoCA) at 2 and 4 weeks

Key secondary outcome(s))
1. Cognitive impairment is measured using the Addenbrooke's Cognitive Assessment- III (ACE-III) questionnaire at Assessment Visit
2. Functional impairment is measured using the Bristol Activities of Daily Living Scale (BADLS) questionnaire at Assessment Visit
3. Mood disorder is measured using the Hospital Anxiety and Depression Scale (HADS) questionnaire at Assessment Visit

05/03/2019: timepoint changed from baseline to Assessment Visit.

Completion date
31/08/2021

Eligibility

Key inclusion criteria
Current inclusion criteria as of 05/03/2019:

Inclusion criteria for the control group:
1. Addenbrooke's Cognitive Assessment (ACE-III) score of >= 90/100
2. Bristol Activities of Daily Living Scale score of "unimpaired" or "mildly impaired"
3. Capacity to understand the information about the study and to give consent to participate
4. Males and females aged between 55-90 years.
5. Not currently on medication that may interfere with the study results.
6. In good general health.

Inclusion criteria for MCI group:
1. A clinical diagnosis of MCI according to NINCDS-ADRDA criteria

2. Males and Females aged 55-90 years.
3. Willing and able to provide informed consent.

Inclusion criteria for AD group:
1. A clinical diagnosis of Mild-AD according to NINCDS-ADRDA criteria
2. Males and females aged 55-90 years.
3. Willing and able to provide informed consent

Previous inclusion criteria:

Inclusion criteria for the control group:
1. Addenbrooke's Cognitive Assessment (ACE-III) score of >= 90/100
2. Bristol Activities of Daily Living Scale score of "unimpaired" or "mildly impaired"
3. Capacity to understand the information about the study and to give consent to participate
4. Males and females aged between 55-80 years
5. Not currently on medication that may interfere with the study results
6. In good general health
7. Matched for age and education

Inclusion criteria for MCI group:
1. A clinical diagnosis of MCI according to NINCDS-ADRDA criteria
2. Addenbrooke's Cognitive Assessment (ACE-III) score >= 82
3. Males and Females aged 55-80 years
4. Willing and able to provide informed consent

Inclusion criteria for AD group:
1. A clinical diagnosis of Mild-AD according to NINCDS-ADRDA criteria
2. Addenbrooke's Cognitive Assessment (ACE-III) score of >= 66/100 and <= 88/100
3. Males and females aged 55-80 years
4. Willing and able to provide informed consent

Participant type(s)
Mixed

Healthy volunteers allowed
No

Age group
Senior

Sex
All

Key exclusion criteria
Current exclusion criteria as of 05/03/2019:

Exclusion criteria for the control group:
1. Presence of significant cerebrovascular disease i.e. history of CVA
2. Major medical co-morbidities e.g. congestive cardiac failure, diabetes mellitus with renal impairment
3. Major psychiatric disorder e.g. chronic psychosis, recurrent depressive disorder, generalised

anxiety disorder.
4. The use of cognitive enhancing drugs e.g. cholinesterase inhibitors
5. A concurrent diagnosis of epilepsy
6. A history of alcohol dependence
7. A history of illicit drug use
8. A history of severe visual impairment, e.g. macular degeneration, diabetic retinopathy, as determined by the clinical team
9. A history of head trauma
10. Severe upper limb arthropathy

Exclusion criteria for MCI group:
1. Patients who fulfill criteria for a diagnosis of Mild AD
2. Major medical co-morbidities e.g. congestive cardiac failure, diabetes mellitus with renal impairment
3. Major psychiatric disorder e.g. chronic psychosis, recurrent depressive disorder, generalised anxiety disorder.
4. The use of cognitive enhancing drugs e.g. cholinesterase inhibitors
5. A concurrent diagnosis of epilepsy
6. A history of alcohol misuse
7. A history of illicit drug use
8. A history of severe visual impairment, e.g. macular degeneration, diabetic retinopathy, as determined by the clinical team
9. A history of head trauma
10. Presence of sleep apnoea
11. Severe upper limb arthropathy

Exclusion criteria for AD group:
1. Patients who fulfill criteria for a diagnosis of moderate AD or other types of dementia
2. Major medical comorbidities e.g. congestive cardiac failure, diabetes mellitus with renal impairment
3. Major psychiatric disorder eg. chronic psychosis, recurrent depressive disorder, generalised anxiety disorder.
4. A concurrent diagnosis of epilepsy
5. A history of alcohol misuse
6. A history of illicit drug use
7. A history of severe visual impairment, e.g. macular degeneration, diabetic retinopathy, as determined by the clinical team
8. A history of head trauma
9. Presence of sleep apnoea
10. Severe upper limb arthropathy

Previous exclusion criteria:

Exclusion criteria for the control group:
1. Presence of significant cerebrovascular disease i.e. history of CVA
2. Major medical co-morbidities e.g. congestive cardiac failure, diabetes mellitus with renal impairment
3. Major psychiatric disorder eg. chronic psychosis, recurrent depressive disorder, generalised anxiety disorder
4. The use of cognitive enhancing drugs e.g. cholinesterase inhibitors
5. A concurrent diagnosis of epilepsy
6. A history of alcohol dependence

7. A history of illicit drug use
8. A history of severe visual impairment, e.g. macular degeneration, diabetic retinopathy, as determined by the clinical team
9. A history of head trauma
10. Severe upper limb arthropathy

Exclusion criteria for MCI group:
1. Patients who fulfill criteria for a diagnosis of mild AD
2. Major medical comorbidities e.g. congestive cardiac failure, diabetes mellitus with renal impairment
3. Major psychiatric disorder e.g. chronic psychosis, recurrent depressive disorder, generalised anxiety disorder.
4. The use of cognitive enhancing drugs e.g. cholinesterase inhibitors
5. A concurrent diagnosis of epilepsy
6. A history of alcohol misuse
7. A history of illicit drug use
8. A history of severe visual impairment e.g. macular degeneration, diabetic retinopathy, as determined by the
clinical team
9. A history of head trauma
10. Addenbrooke's Cognitive Assessment (ACE-III) score of <= 81/100
11. Presence of sleep apnoea
12. Severe upper limb arthropathy

Exclusion criteria for AD group:
1. Patients who fulfill criteria for a diagnosis of moderate AD or other types of dementia
2. Major medical comorbidities e.g. congestive cardiac failure, diabetes mellitus with renal impairment
3. Major psychiatric disorder e.g. chronic psychosis, recurrent depressive disorder, generalised anxiety disorder
4. A concurrent diagnosis of epilepsy
5. A history of alcohol misuse
6. A history of illicit drug use
7. A history of severe visual impairment, e.g. macular degeneration, diabetic retinopathy, as determined by the clinical team
8. A history of head trauma
9. Addenbrooke's Cognitive Assessment (ACE-III) score of < 65/100
10. Presence of sleep apnoea
11. Severe upper limb arthropathy

Date of first enrolment
31/08/2018

Date of final enrolment
28/02/2022

Locations

Countries of recruitment
United Kingdom

England

Study participating centre
South London & Maudsley NHS Foundation Trust
London
United Kingdom
SE5 8AZ

Sponsor information

Organisation
Cognetivity Limited

Funder(s)

Funder type
Industry

Funder Name
Cognetivity Limited

Results and Publications

Individual participant data (IPD) sharing plan
The data sharing plans for the current study are unknown and will be made available at a later date.

IPD sharing plan summary
Data sharing statement to be made available at a later date

Study outputs

Output type	Details	Date created	Date added	Peer reviewed?	Patient-facing?
HRA research summary			28/06/2023	No	No
Participant information sheet	Participant information sheet	11/11/2025	11/11/2025	No	Yes