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The University of Manchester
Institute for Collaborative
Research on Ageing

The Free-Cog

A novel hybrid scale for
the assessment of
cognitive and executive
function

WELCOME

Time	Agenda Item	Presented by
14:00	Welcome, and Introductions	Alistair Burns
14:05	Development of Free-Cog	Alistair Burns
14:15	Metrics of Free-Cog	Julie Morris
14:25	Experience with Free-Cog - Memory Clinics	Judith Harrison
14:35	Experience with Free-Cog – Neurology Clinics	Andrew Larner
14:45	Electronic Free-Cog	Ross Dunne
14:50	General discussion and Frequently Asked Questions	All
15:30	Close	Alistair Burns

AGENDA

Development of Free-Cog

Many cognitive tests are available
Most concentrate on scores, not the art of cognitive assessment
Free-Cog is a novel hybrid scale
Driven by patient experience and opinion
Conversational style
Want people to use it and tell us what you think
Tele Free-Cog developed for COVID pandemic

<https://onlinelibrary.wiley.com/doi/full/10.1002/gps.5454>

DOI: 10.1002/gps.5454

RESEARCH ARTICLE

Geriatric Psychiatry WILEY

A novel hybrid scale for the assessment of cognitive and executive function: The Free-Cog

Alistair Burns¹ | Judith R. Harrison² | Catherine Symonds³ | Julie Morris¹

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Cognitive Function (1)

Cognitive Function			
Domain	Question/Instruction	Score	Scoring guide
General Knowledge	Can you tell me anything that's in the news recently?	/1	This is a general opening question to try to put people at ease, also accept recent events in sport or soap opera, if they state they don't follow the news. Score 1 for any key fact of current knowledge but none for a general answer
Orientation (time)	What day of the week is it today; what month, year?	/3	Only allow accurate responses Score 1 point for each correct answer
Orientation (place)	Where are we?	/3	Only allow accurate responses If in clinic/hospital score 1 for ward/ floor; 1 for hospital name; 1 for town If in residence Score 1 for name/number of house; 1 for street name; 1 for town
Memory (registration)	Repeat 5 words (watch, car, scarf, pen, house)	0	No score, record responses, allow up to 3 attempts.
Calculation	Take 6 away from 70 and keep subtracting until I say stop	/3	64, 58, 52, 46, 40, then stop Score 3 = 5 or 4 correct; Score 2 = 3 or 2 correct Score 1 = 1 correct; Score 0 = 0 correct
Attention	Spell "plate" backwards	/2	Check first they can spell "plate" then ask to spell it backwards Score 2 = 5 or 4 letters in correct order Score 1 = 3 or 2 letters in correct order Score 0 = 1 or 0 letters in the correct order

Cognitive Function (2)

Memory (recall)	Repeat 5 words (watch, car, scarf, pen, house)	/5	Record responses Score 1 point for each correct answer
Visuospatial	In this circle draw a clock face with numbers and with hands set to ten past eleven	/3	Draw a circle for the patient Score 1 point for each correct part: All numbers present = 1 point All numbers placed correctly = 1 point Hands placed correctly = 1 point
Language	Name ear and fingernail	/2	Point to ear then fingernail Score 1 point for each correct answer
Fluency Task	Name as many different animals as you can in 1 minute	/1	Time one minute and record the responses Do not count different breeds of the same animal (eg corgi, spaniel, Cockapoo, Alsatian etc). Score 1 = if 10 or more correct responses Score 0 = if <10 responses
Repeat a Sentence	Repeat this sentence "Don't beat about the bush"	/1	Score 1 for repeated fully correctly
Write a Sentence	Write a sentence	/1	Sentence needs to be understandable – ignore minor grammatical and spelling errors; Score 1 if fully correct

Executive Function

Executive Function			
Domain	Question	Score	Scoring guide These questions are to test the person's ability to plan and describe sequences. Scoring is based on clinical judgement, non-leading clarifying questions may be asked if answers are tangential/ circumstantial
Social	You have bought a birthday card and want to send it by post – tell me how you would do it?	/1	Score 1 = complete enough for the card to arrive Score 0 = incomplete answer (i.e. card would not arrive)
Travel	If you were going to take a bus (or train) what would you need?	/1	Score 1 = if answer indicates need for a ticket or bus pass Score 0 = if they fail to mention ticket or bus pass
Home	Could you tell me how you would make a cup of tea or coffee for yourself?	/1	Score 1 = if answer leads to a drinkable cup of tea/coffee Score 0 = if answer does not lead to a drinkable cup of tea/coffee
Emergency	If you discovered a fire at home, what would you do?	/1	Score 1 = if answer indicates the person would be appropriate and safe in their response; Score 0 = if they do not
Care	Could you tell me the steps you took in order to get dressed as you are today?	/1	Score 1 = plausible story, consistent with the clothes they are wearing Score 0 = incomplete and seems inconsistent with the clothing they are wearing
		Total	/30

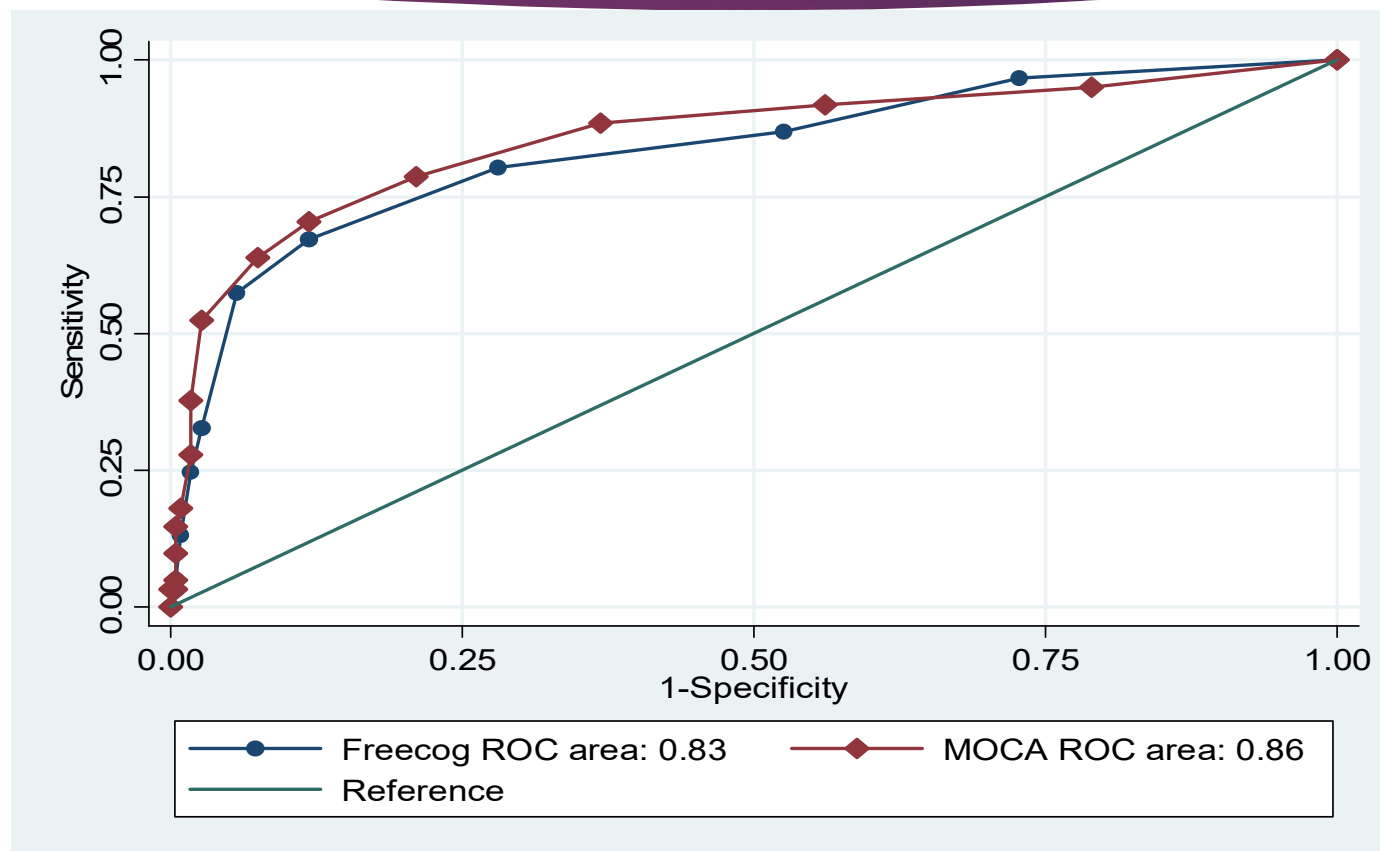
Julie Morris – Free Cog Metrics Study participants

	Controls	MCI	Dementia
Number	355	128	465
Mean age	63.1	76.0	77.3
% Female	70%	49%	44%

Mean test scores

	Control	MCI	Dementia
Total Free-Cog	28.1	25.1	20.0
Cognitive Free-Cog	23.1	20.5	15.8
Executive Free-Cog	4.8	4.7	4.1
MOCA	27.8	23.4	17.1
MMSE	28.7	26.2	21.6
ACE	84.2	73.9	63.5

MCI vs Controls



Sensitivity and Specificity of Free-Cog

	Cut-point	Sensitivity	Specificity
MCI vs Control	≤ 27	75%	70%
Dementia vs Control	≤ 26	83%	80%
Dementia vs MCI	≤ 24	77%	63%

Experience with Free-Cog – Memory Clinics

Dr Judith Harrison

Free-Cog was designed to:

- ▶ Combine assessment of cognitive & executive function
- ▶ Detect significant, rather than subtle, impairment
- ▶ Be more like a conversation than a test
- ▶ Be concise

The Obviously Impaired Patient

- ▶ Other cognitive assessments detect subtle deficits
- ▶ Free-Cog is useful to measure cognition where deficits are expected^{1,2}
- ▶ Avoids distress for patient/careers caused by lengthy or complex tools

1. Burns, A et al. Int J Geriatr Psychiatry, 2021; 36: 566-572.
2. Lerner AJ. Dement Geriatr Cogn Disord. 2019;47(4-6):254-263.

The Anxious Patient

- ▶ Patients who are anxious often perform less well on cognitive tests¹
- ▶ Worries and intrusive thoughts compete with working memory
- ▶ Free-Cog's conversational style can be useful for patients with performance anxiety

1. Wetherell et al, *The Journals of Gerontology*: 2002. 57, 3, 246–255

Patient Monitoring

- ▶ Free-Cog can be completed in around 5 minutes¹
- ▶ Ideal for a follow-up appointment
- ▶ Telephone version for remote consults

1. Larner AJ. Dement Geriatr Cogn Disord. 2019;47(4-6):254-263.

Practical Use of Free-Cog: Neurology Clinics – AJ Larner

Cognitive Function Clinic cohort (N = 141)

Free-Cog for diagnosis of dementia
(cut-off $\leq 22/30$, maximal Youden index)

Sensitivity = 1.00, Specificity = 0.67

For dementia diagnosis in this setting, Free-Cog has high sensitivity

Applying the “SnNOut” rule:

For a test with high sensitivity, a negative (normal) result effectively rules out the diagnosis of dementia

Practical Use of Free-Cog: Neurology Clinics

Cognitive Function Clinic cohort (N = 126)

For diagnosis of MCI (cut-off $\leq 22/30$):

Sensitivity = 0.58, Specificity = 0.81

For MCI diagnosis in this setting, Free-Cog has high specificity

Applying the “SpPIn” rule:

For a test with high specificity, a positive result effectively rules in the diagnosis of MCI

Practical use of Free-Cog: Neurology Clinics

Tele-Free-Cog

Omitting both orientation in place and tests requiring visual cues or assessment. Denominator is reduced from 30 to 21

For diagnosis of dementia (cut-off $\leq 10/21$):

Sensitivity = 0.80; Specificity = 0.89

For diagnosis of MCI (cut-off $\leq 13/21$):

Sensitivity = 0.56; Specificity = 0.84

Practical use of Free-Cog

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












Larner AJ. *Neurodegener Dis Manag* 2021; 11: 77-82

Burns A, Larner AJ. Do we need yet another cognitive test? Free-Cog, a novel, hybrid, cognitive screening instrument. *J Neurol Neurosurg Psychiatry* 2021 Mar 15 doi: 10.1136/jnnp-2020-325830.

Ross Dunne

Free Cog Web App

- ▶ Simple
- ▶ Calculates for you
- ▶ HTML & Javascript for sums
- ▶ Prints to PDF like any web page
- ▶ Uses a HTML table so won't be good for mobile, yet
- ▶ No info to a server

Cognitive Function			
FreeCog v 1.0 (January 2017)			
Domain	Question/Instruction	Score	Scoring Guide
General Knowledge	Can you tell me anything that's in the news recently?	 /1	This is a general opening question to try to put people at ease, also accept recent events in sport or soap opera, if they state they don't follow the news. Score 1 for any key fact of current knowledge but none for a general answer
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Next up....

- ▶ Android App by early 2022
- ▶ Will be free (as in beer) and free (as in freedom to do whatever you like with the code)
- ▶ No server side application for the sake of confidentiality (and nowhere to put anything but an EPR number)
- ▶ But....
- ▶ Could be an option to collect anonymised data for use as a research tool

Why learn to code? And How to learn...

- ▶ 21st century literacy
- ▶ Never been easier
- ▶ Download and install Python and play with it
- ▶ Do a COURSERA course / MOOC
- ▶ Solve a problem for yourself

General discussion

Concluding remarks