Impact of aging and stroke on a new computerized test of visual attention in far space

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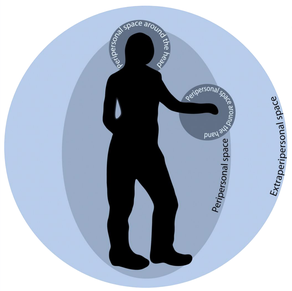
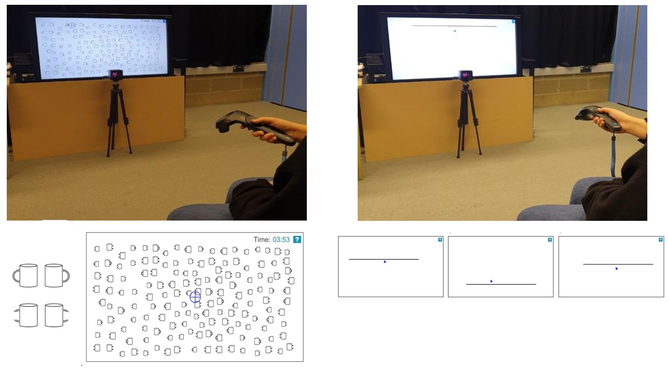
COMPUTERIZED EXTRAPERSONAL NEGLECT TEST (CENT)

- Visual attention deficits are very common following stroke with visual neglect as a classic manifestation.
- Visual neglect has been shown to dissociate between near and far space [1], but currently there is no validated tool that measures visual attention in far space [2].



- **CENT** is a quick & portable test of **visual attention in far space.**
- Visual Search analysis adapted from [3].

Visual Search task ***Bisection task***



Study 1: Descriptive statistics of normative sample (n = 179)

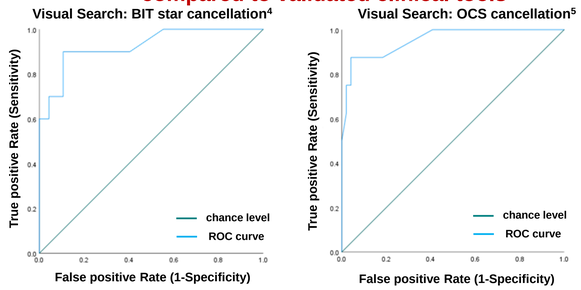
Age group	Mean age (SD)	n Female	n Male	n Total	Handedness			Mean year's education
					Left	Right	Ambidextrous	
18-29	23.11 (3.21)	20	16	36	3	29	3	16.77 (1.99)
30-39	35.23 (3.11)	11	15	26	5	20	0	17.21 (5.28)
40-49	43.50 (2.93)	13	7	20	2	17	0	17.19 (4.18)
50-59	55.03 (2.68)	19	18	38	2	32	1	16.44 (3.78)
60-69	63.73 (2.99)	13	17	32	4	27	1	15.70 (3.72)
70-79	72.93 (2.32)	8	10	19	3	14	2	14.97 (4.21)
80-94	84.75 (4.50)	5	3	8	2	6	0	15.75 (4.00)
Overall	49.29 (18.36)	89	86	179	21	145	7	16.34 (3.84)

Study 2: Descriptive statistics of stroke survivors and controls

	Neglect (n = 20)	No neglect (n = 37)	Healthy controls (n = 57)
Age; mean (SD, min, max)	69.70 (8.95, 48-88)	68.49 (13.20, 32-90)	69.00 (7.26, 60-88)
Sex; N (%)			
Female	7 (35%)	17 (45.90%)	24 (42.10%)
Male	13 (65%	20 (54.10%)	30 (52.60%)
Missing			3 (5.30%)
Years education; mean (SD, min, max)	7.08 (3.67, 4-16)	7.08 (3.53, 2-16)	11.47 (21.59, 8.50-26)
Handedness; N (%)			
Right	18 (90%)	31 (83.80%)	45 (78.90%)
Left	2 (10%)	6 (16.20%)	9 (15.8%)
Ambidextrous	0 (0%)	0 (0%)	3 (5.30%)
Side of stroke; N (%)			
Left	5 (25%)	14 (37.80%)	
Right	14 (70%)	22 (59.50%)	
Bilateral	1 (5%)	1 (2.70%)	
Type of stroke; N (%)			
Ischaemic	17 (85%)	34 (91.90%)	
Haemorrhagic	2 (10%)	3 (8.10%)	
Missing	1 (5%)	0 (0%)	
Side of weakness; N (%)			
Left	11 (55%)	16 (43.20%)	
Right	3 (15%)	6 (16.20%)	
None	6 (30%)	15 (40.50%)	
Days post-stroke; mean (SD, min, max)	103.25 (59.24, 32-252)	105.76 (124.26, 19-783)	
Length of stay; mean days (SD, min, max)	21.82 (25.20, 1-98)	13.46 (20.38, 1-91)	

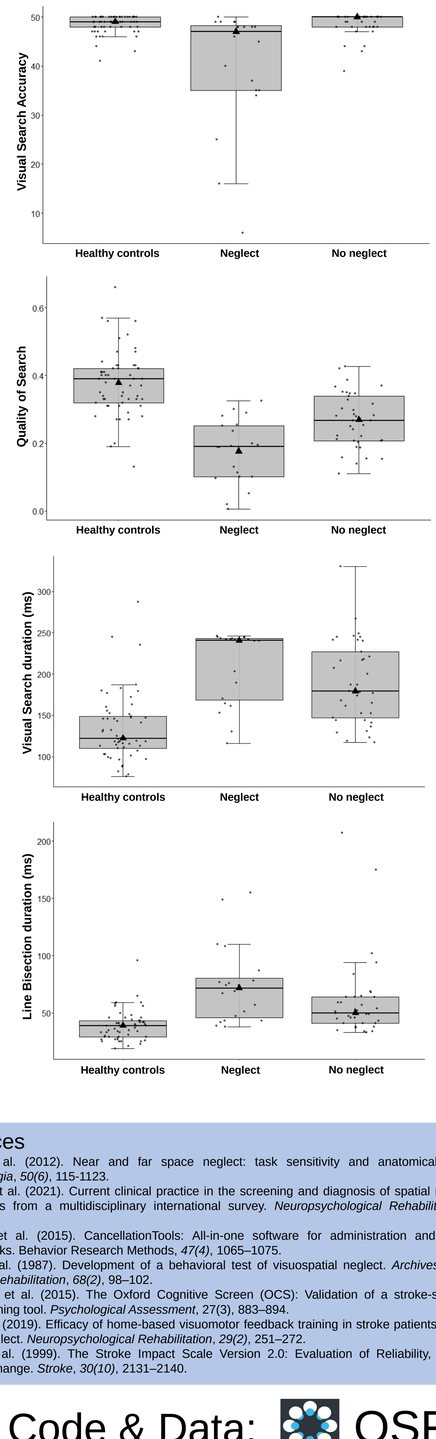
STUDY 2: IMPACT OF STROKE (N = 57 STROKE PATIENTS + 57 CONTROLS)

CENT visual search has excellent diagnostic accuracy compared to validated clinical tools

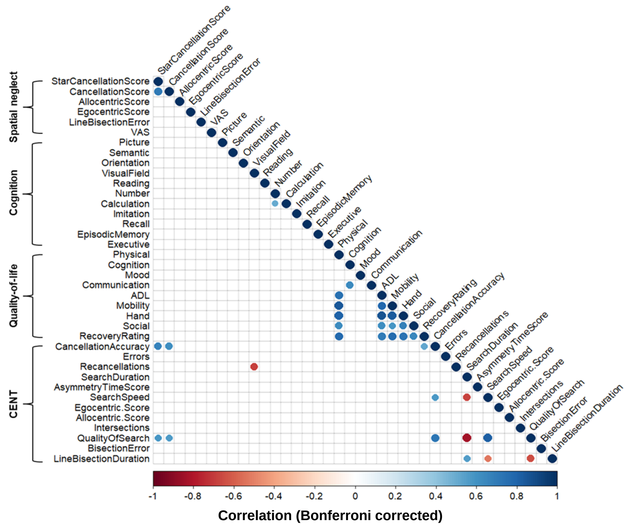


		Validation test	N	Score direction	Sensitivity rate (true positives)	False positives	Specificity rate (true negatives)	False negatives
CENT Visual Search	Overall accuracy score	BIT[4] Star Cancellation	57		80%↑	10.60%	89.40%↑	20%
		OCS[5] Cancellation	57		87.50%↑	12.20%	87.80%↑	12.50%
CENT Bisection	Line bisection error	Paper-and-pencil line bisection[6]	57	Right neglect	84.60%↑	93.20%	6.80%↓	15.40%
				Left neglect	23.10%↓	0%	100%↑	76.90%

Neglect-specific deficits in CENT visual search accuracy & quality of search

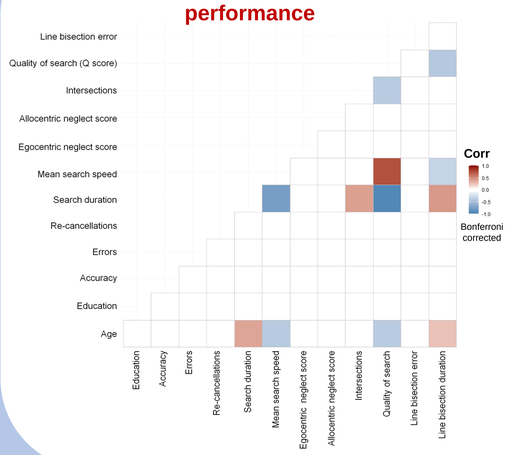


CENT has good validity, internal consistency & visual search accuracy correlates with stroke recovery[7]



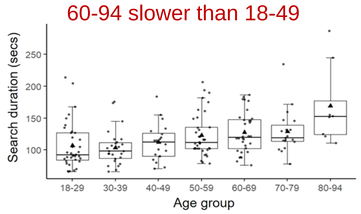
STUDY 1: IMPACT OF HEALTHY AGING (N = 179)

Age significantly correlates with CENT performance



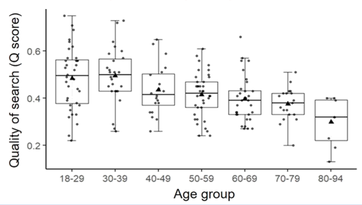
Search duration increases with age

60-94 slower than 18-49

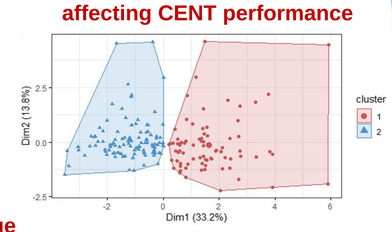


Quality of search decreases with age

60-94 poorer quality than 18-39



Age is the primary factor affecting CENT performance



- Cluster 1 were younger than Cluster 2 (no other demographics differed)
- Cluster 1 (*n* = 103; mean age = 44): shorter search and bisection durations, fewer intersections in search path, higher quality of search score and increased rightward error in bisection task
- Cluster 2 (*n* = 76; mean age = 57): longer search and bisection durations, more intersections, lower quality of search, and increased leftward error in bisection task

Watch CENT demo

Thank you to recruitment sites

NHS Norfolk Community Health and Care NHS Trust

NHS Cambridge University Hospitals NHS Foundation Trust

east coast community healthcare

NHS Norfolk and Norwich University Hospitals NHS Foundation Trust

NHS Cambridgeshire and Peterborough NHS Foundation Trust

References

[1] Amiola et al. (2012). Near and far space neglect: task sensitivity and anatomical substrates. *Neuropsychologia*, *50(6)*, 115-1123.

[2] Checketts et al. (2021). Current clinical practice in the screening and diagnosis of spatial neglect post-stroke: Findings from a multidisciplinary international survey. *Neuropsychological Rehabilitation*, *31(9)*, 1495–1526.

[3] Dalmaijer et al. (2015). CancellationTools: All-in-one software for administration and analysis of cancellation tasks. Behavior Research Methods, *47(4)*, 1065–1075.

[4] Wilson et al. (1987). Development of a behavioral test of visuospatial neglect. *Archives of Physical Medicine and Rehabilitation*, *68(2)*, 98–102.

[5] Demeyere et al. (2015). The Oxford Cognitive Screen (OCS): Validation of a stroke-specific short cognitive screening tool. *Psychological Assessment*, 27(3), 883–894.

[6] Rossit et al. (2019). Efficacy of home-based visuomotor feedback training in stroke patients with chronic hemispatial neglect. *Neuropsychological Rehabilitation*, *29(2)*, 251–272.

[7] Duncan et al. (1999). The Stroke Impact Scale Version 2.0: Evaluation of Reliability, Validity, and Sensitivity to Change. *Stroke*, *30(10)*, 2131–2140.

Stroke Association

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