Exploring Age-Graded Performance on the New EyeFocus Cancellation Task to Assess Visual Neglect

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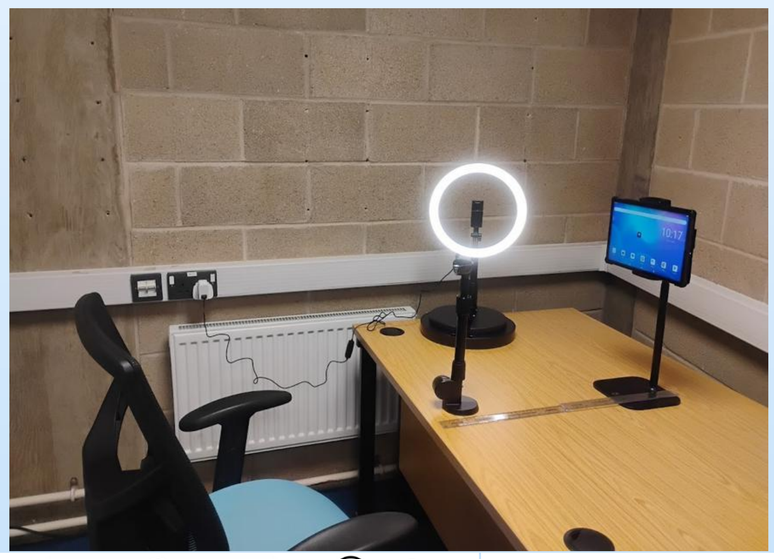
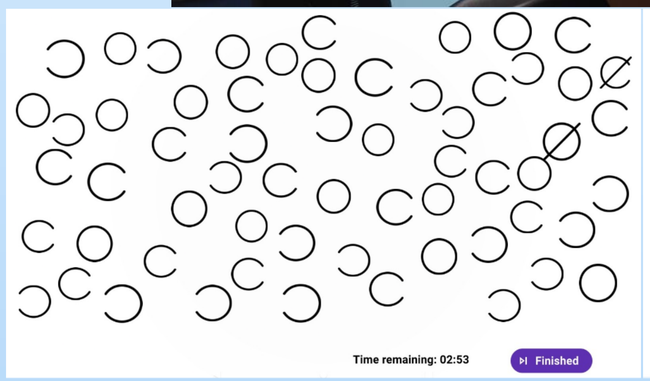
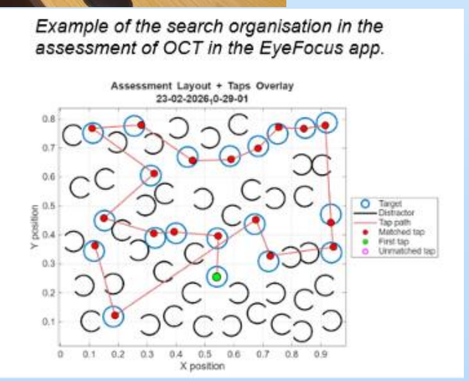
Background

Visual neglect (VN) is failure to detect or respond to contralesional stimuli, unrelated to primary sensory loss [1,2].
VN affects approximately 30% of people following **right-hemisphere stroke** [3].
VN impairs rehabilitation outcomes and post-stroke quality of life [1-3].
Challenging diagnosis: Diagnostic tools used have low sensitivity [4]**.**
Accurate diagnosis is essential for rehabilitation.
Digital assessment supports NHS digitalisation goals [5].
EyeFocus, developed by UEA and Animorph Ltd., with the digital Ota Circle Cancellation Task [9] offering:
Egocentric and allocentric neglect measurement, Timing, speed, and movement tracking in a feasible digital assessment [11] and Visual-search analysis [2]
Ageing influences visual-search performance and should be considered when interpreting results [6-8].







Methods

- **Ethical approval**: ETH2526-0472. Recruitment with UEA's SONA system, paid participant panel, and opportunity sampling at a local public library.
- **Exclusion criteria:** Neurological conditions; uncontrolled psychiatric or visual disorders; relevant medication use; or severe motor impairment. Corrective glasses were permitted.
- **Procedure:** Participants used a centrally positioned tablet at a fixed viewing distance of 50 cm, supported by an adjustable chin rest.
- **Task:** Following written and verbal instructions, participants cancelled 20 complete circles among 20 left- or right-gap distractors, randomly distributed across the screen, within 3 minutes.
- **9 visual search measures** analysed [7] by Spearman-rho, Welch ANOVA with post-hoc Games-Howell.

Results

Demographics

Age group (n)	Mean year (SD)	Min -Max	Gender	Handedness	Mean years of education*
18-29 (12)	19 (1.22)	18 - 21	Female= 6 Male= 5 Non-binary= 1	Right: 10 Left: 2 Ambidextrous: 0	14
30-49 (10)	39 (7.41)	30 -49	Female= 4 Male= 6 Non-binary= 0	Right: 7 Left: 3 Ambidextrous: 0	17
50-59 (14)	52 (2.93)	50 -59	Female= 12 Male= 2 Non-binary= 0	Right: 12 Left: 2 Ambidextrous: 0	16
60-69 (13)	63 (3.21)	60 -68	Female= 5 Male= 8 Non-binary= 0	Right: 11 Left: 1 Ambidextrous: 1	15
More than 70 (15)	77 (4.80)	70 -86	Female= 9 Male= 6 Non-binary= 0	Right: 14 Left: 0 Ambidextrous: 1	15
Overall (64)	52 (20.64)	18- 86	Female= 36 Male= 27 Non-binary= 1	Right: 54 Left: 8 Ambidextrous: 2	15

Summary of the correlation of variables and age with Spearman's rho analysis

Variable	Spearman's rho with Age	*p*-value
Accuracy	−.030	.812
Recancellations	NaN	NaN
Number of intersections	.304	.015 *
Normalised egocentric score	.107	.402
Allocentric score	NaN	NaN
Search speed (mm)	−.530	< .001 *
Search duration (Total time seconds)	.708	< .001 *
Distractor error rate percent	NaN	NaN
Quality of Search (QScore)	-.714	<.001 *

Note: Values with a * are statistically significant

Preliminary age-graded performance cutoffs for quality of search and search speed

Age group	QScore 5th percentiles	Search speed 5th percentiles
18–29	0.69	25.12
30–49	0.77	29.84
50–59	0.66	26.37
60–69	0.52	24.98
70+	0.28	25.25

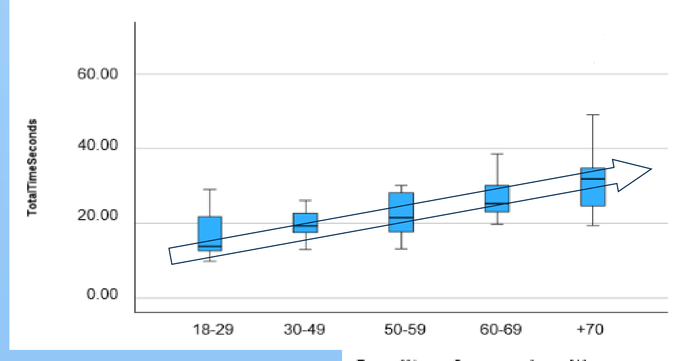
Note: scores may indicate unusually slow search and poor search quality for this age range, respectively.

Table and graphs of different performances of Search efficiency amongst the age groups

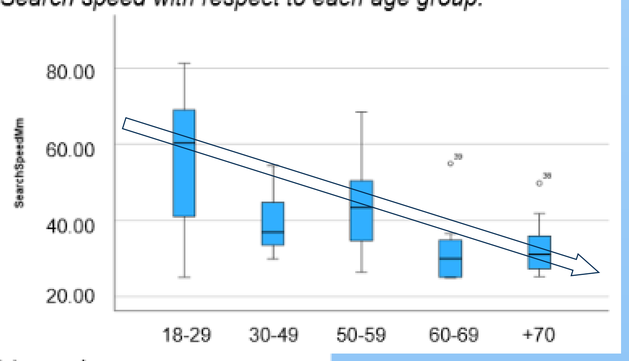
Age groups compared	Search duration, *M* difference	*p*	Search speed, *M* difference	*p*	Quality of search, *M* difference	*p*
(18–29) vs. (30–49)	−2.57	.768	16.88	.066	0.24	.465
(18–29) vs. (50–59)	−4.80	.266	10.88	.431	0.31	.190
(18–29) vs. (60–69)	−9.95	**.003***	24.57	**.005***	0.51	**.009***
(18–29) vs. (+70)	−17.74	**.003***	23.73	**.006***	0.63	**.002***
(30–49) vs. (50–59)	−2.24	.762	−5.99	.621	0.08	.933
(30–49) vs. (60–69)	−7.38	**.008***	7.69	.186	0.28	**.033***
(30–49) vs. (+70)	−15.17	**.010***	6.85	.206	0.40	**.003***
(50–59) vs. (60–69)	−5.15	.124	13.69	**.022***	0.20	.090
(50–59) vs. (+70)	−12.93	**.033***	12.85	**.025***	0.32	**.006***
(60–69) vs. (+70)	−7.79	.335	−0.84	.998	0.12	.384

Note: Values with a * are statistically significant according to pair-wise post-hoc Games-Howell comparisons

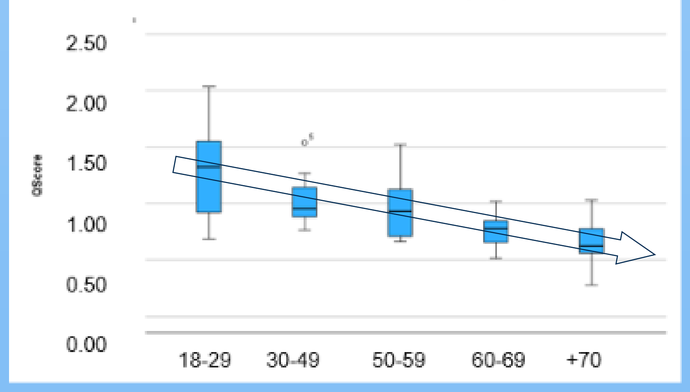
Search duration with respect to each age group.



Search speed with respect to each age group.



Quality of search with respect to each age group.



Discussion

- **Age affected search efficiency more than accuracy or spatial bias.**
- Search efficiency performance declined across the lifespan.
- **60–69 and +70 years** showed longer search duration, slower search speed and lower quality of search.
- Significant declines emerged from **50–59 years for search duration and quality**, and from **60–69 years for search speed**.
- **Accuracy did not differ significantly by age.**
- Preserved accuracy may reflect a **ceiling effect** with **compensatory mechanisms** [5-6], **enhanced carefulness** in older adults [7] or simple design and clear instructions of task.

Limitations & Future Directions

- **Small, unevenly distributed sample**: Combining participants in their 30s and 40s prevented decade-specific analysis, while the restricted 18–21-year range excluded the mid- and late 20s. The 50–59 group also had a marked gender imbalance (6:1), although gender was not examined.
- **Limited variability**: Allocentric errors, recancellations, and distractor error rates were consistently zero, preventing further statistical analysis.

This study provided insightful age-graded data for search efficiency using digital tools.
This enables further research on visual search and the feasible assessment of visual neglect, in line with the NHS's goal of digital transition[4].

References

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