

3. NeuroTracker Cognition Enhancement in Aging

Perceptual-Cognitive Training Can Improve Cognition in Older Adults with Subjective Cognitive Decline

[Research Open](#)

Aim

To investigate if perceptual-cognitive training can provide a proactive intervention to enhance cognition in older adults with memory problems.

Method

47 healthy participants aged 60-90 with subjective memory problems were divided into active and control groups. All participants completed three robust neuropsychological assessments over a three-month period. Active participants completed these before, after and following a 7 week NeuroTracker training intervention.

Findings

The NeuroTracker trained group improved significantly on the task, with significant or major transfer to scores in memory tasks (e.g., CVLT-II: Immediate Free Recall; Short-Term Memory Recall, and Long-Term Memory Recall), working memory tasks (e.g., Digit Span Backward) and cognitive flexibility tasks (e.g., D-KEFS Verbal Fluency Category Switching and D-KEFS Verbal Fluency Letter Fluency). NeuroTracker scores also correlated to the scale of these improvements for processing speed, memory performance, and cognitive flexibility.

Furthermore, some increased transfer benefits were found one month after the training intervention, potentially indicating heightened neurogenesis and promise for neuroplastic cognitive rehabilitation. The overall results suggest that this form of perceptual-cognitive training can significantly enhance cognition in a sustained way, with a relatively short training intervention.

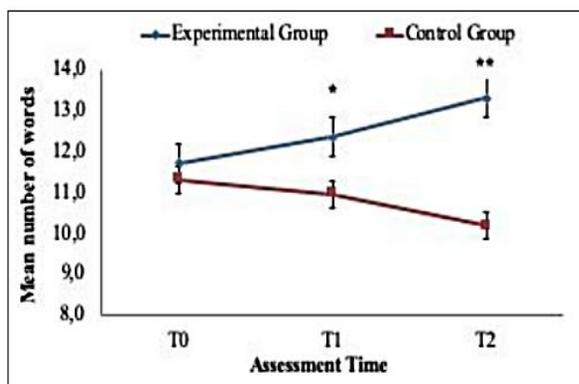


Figure 2. Linear trend analysis. Long-delay memory recall measured with CVLT-II List A/B Long-Delay.

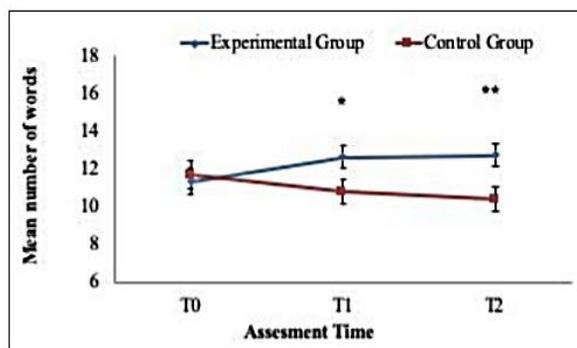


Figure 3. Linear trend analysis. Verbal cognitive flexibility measured with D-KEFS Verbal Fluency Test: Category Switching.

4. Enhancing Cognitive Functions in Healthy Elders

3-Dimensional Multiple Object Tracking Training Can Enhance Selective Attention, Psychomotor Speed, and Cognitive Flexibility in Healthy Older Adults

[Research Open](#)

Aim

To investigate if a short NeuroTracker training intervention could improve high-level cognitive abilities in elderly populations.

Method

46 participants, aged 63-87 years old completed pre-and-post neuropsychological assessments for selective attention, psychomotor speed, and cognitive flexibility. Active participants completed 21 NeuroTracker sessions (approx. 2 hours of training) over 7 weeks, between pre-and-posts tests. Controls did no training.

Findings

Controls showed no change in pre and post tests. In contrast the active NeuroTracker group experienced significant gains in cognitive flexibility, psychomotor speed, and selective attention, and similar improvements in a combined assessment of psychomotor speed and cognitive flexibility.

The researchers concluded that NeuroTracker presents a promising tool for recovering and improving these high-level cognitive abilities in older populations.

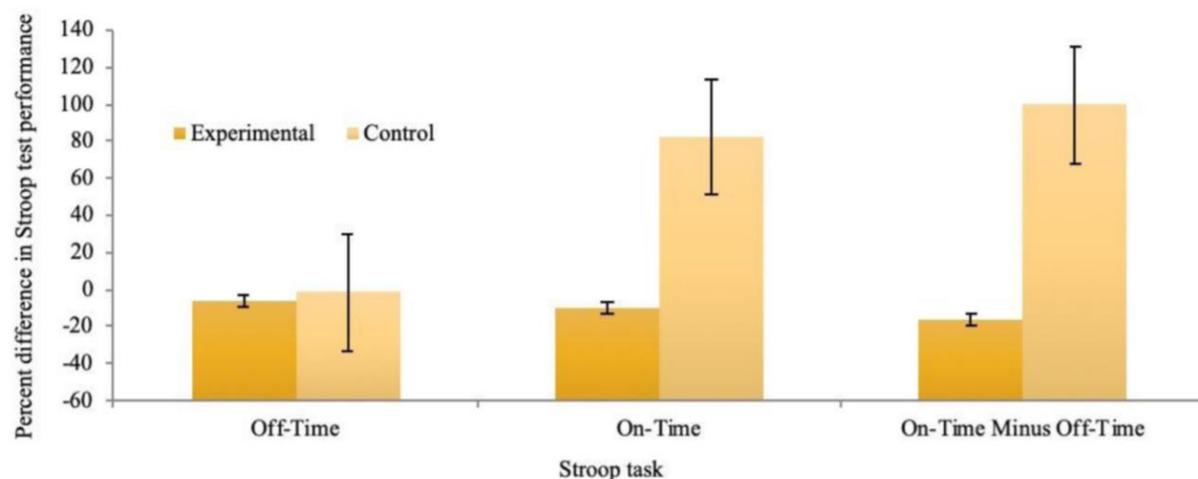


Figure 4. Percent difference in 3 Stroop test tasks between initial appointment and 8 weeks later. The experimental group completed 21 sessions of 3D-multiple object tracking training over a 7-week period. The control group received no intervention.

9. Learning Abilities in Healthy Aging

'Healthy older observers show equivalent perceptual-cognitive training benefits to young adults for multiple object tracking'

[Frontier in Psychology](#)

Aim

This study measured the capacity of older participants to improve their tracking speed thresholds (NeuroTracker), to investigate if age related cognitive decline can be reversed with a training intervention known to be directly relevant to the effects of healthy aging.

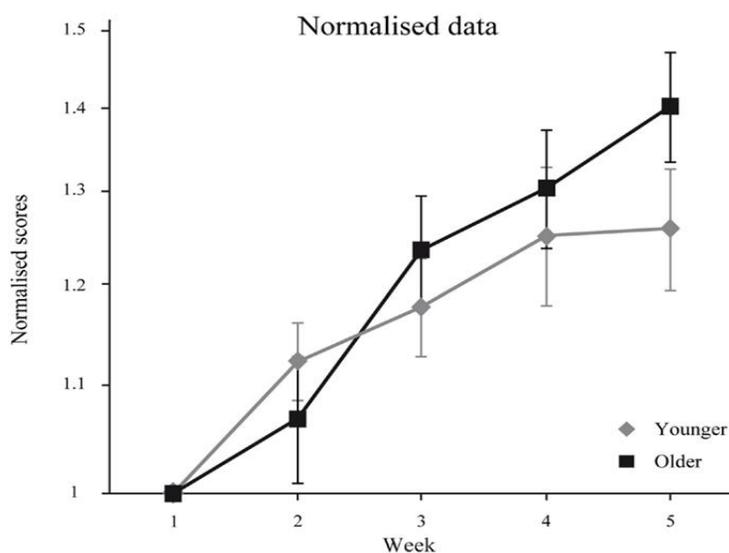
Method

20 healthy younger adults (mean age 24 years old) and 20 healthy older adults (mean age 67 years old) performed 15 NeuroTracker training sessions distributed over 5 weeks.

Findings

Both groups obtained benefit from training with a similar rate of progression. Though the older group started off at a significantly lower level than the younger group, they obtained speed thresholds that were similar to those of untrained younger adults by the end of the training program. Furthermore, towards the end of the training program the rate of learning appeared to have slowed for the younger group, yet the older group still showed a strong learning curve, suggesting greater improvements with continued training.

In conclusion, although healthy older people show a significant age-related deficit in the NeuroTracker task, they respond strongly to training effects and demonstrate an ability to fully reverse age-related functional decline with a short intervention of NeuroTracker training.



10. Reducing Fall-Risk in the Elderly

‘Examination of the Training Effect of the Three Dimensional Multiple Object Tracking Task on Community Dwelling Elderly’

[Physiotherapy Science](#) (in Japanese)

Aim

To investigate if NeuroTracker training could positively influence a number of assessments known to be reliable indicators of fall-risk in older adults.

Method

25 elderly residents (av. 80 years old) of a day care facility were divided into active and control groups. The active group completed a NeuroTracker (3D-MOT) training intervention over 5 weeks, along with a battery of pre and post training assessments relevant to fall-risk. The control group did no NeuroTracker training, but also completed all the pre and post assessments. These included the Mini Mental State Examination (MMSE), Trail Making Test A (TMT-A), 5 meter walking ability, dynamic balance ability, the Timed Up and Go test (TUG), and the Function Reach Test (FRT).

Findings

Overall the participants improved significantly on NeuroTracker scores (+32%), demonstrating a clear learning capacity for this task in old age. The MMSE (a screening test) showed no significant changes for both groups. The NeuroTracker group experienced significant or large post-test improvements on TMT-A, 5 meter walking time, TUG and FRT. In contrast, controls experienced a moderate or significant decline in TMT-A, TUG and FRT, but a significant improvement in walking time.

Overall the researchers conclude that NeuroTracker training offers an effective intervention for preventing falls in an elderly community dwelling.

	The control group (n = 11)		The intervention group (n = 11)	
	Initial evaluation	Final evaluation simple primary effect	Initial evaluation	Final evaluation simple primary effect
MMSE (point)	25.5 ± 2.9	26.8 ± 7.8	27.1 ± 2.5	26.9 ± 1.9
TMT-A (Seconds)	210.3 ± 80.7	228.3 ± 81.6	242.8 ± 110.5	201.9 ± 98.6 *
5 m Walking (in seconds)	7.9 ± 4.0	7.4 ± 2.7	8.1 ± 2.2	7.7 ± 2.0
TUG (Seconds)	17.1 ± 5.1	17.4 ± 5.1	19.5 ± 11.6	17.8 ± 11.8
FRT (cm)	26.8 ± 7.8	24.3 ± 4.0	26.5 ± 7.4	27.2 ± 6.1

The average value ± standard deviation. *: p <0.05.

18. NeuroTracker Case Study on Recovering Memory in Aging

'Memory training and benefits for quality of life in the elderly: A case report'

[Dementia and Neuropsychology](#)

Aim

This case report sought to examine in detail the effects of a combined intervention program (NeuroTracker and Memory Training) for recovering memory and attentional functions in an older individual.

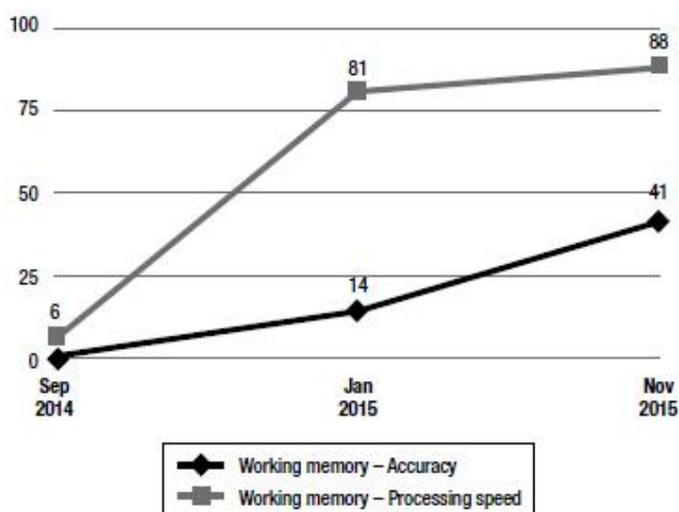
Method

1 healthy 80 year old male with frequent memory complaints underwent 32 NeuroTracker sessions of Sustain mode over 12 months, alongside Memory Training based on consciously learned mnemonic strategies. The patient completed a robust pre-mid-post training battery of tests on memory, quality of life and stress.

Findings

At the post-assessment stage, training proved effective for gains in sustained and alternating attention, with above-average cognitive flexibility. Assessments for memory accuracy and processing speeds showed a steadily rising curve. Improvements were evident in self-perceived attention, memory, quality of life and self-confidence. A reduction in stress symptoms was observed with measured improvements in physical, psychological and environmental domains. NeuroTracker scores showed a rising curve throughout the training program.

Based on the case report findings, the researchers suggested such cognitive training programs should be made available in private and public institutions for elderly care to improve quality of life and delay the signs of senility during the aging process.



20. NeuroTracker and Memory Training for Healthy Aging

'Memory training combined with 3D visuospatial stimulus improves cognitive performance in the elderly: pilot study'

[Dementia & Neuropsychologia](#)

Aim

To investigate if cognitive training programs can reduce expected cognitive decline associated with aging.

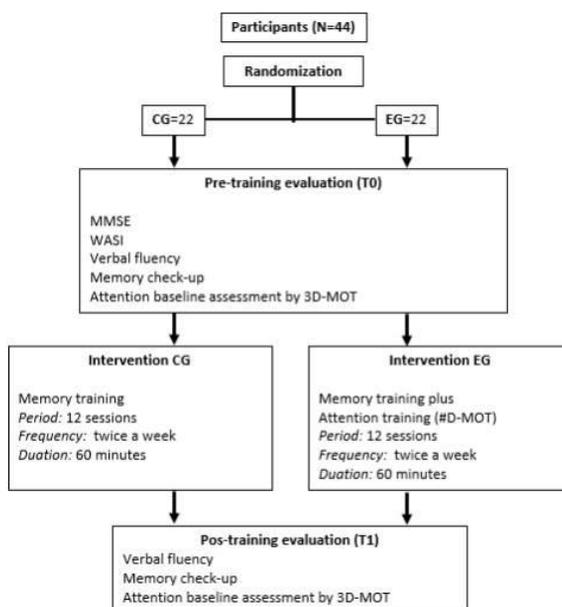
Method

44 participants of 60 years or older were equally divided into an experimental (with NeuroTracker) and a comparative group (without NeuroTracker) and completed 12 training sessions per week. Both groups practiced mnemonic memory training techniques. Pre and post assessments were also conducted, including a sociodemographic questionnaire, neuropsychological assessment and NeuroTracker pre and post baseline measures.

Findings

Both groups experienced some benefits from the memory training, however only the NeuroTracker trained group achieved transfer benefits for attention, reaction time, visual processing speed, episodic, semantic, subjective and working memory as well as aspects of social cognition.

The researchers concluded that NeuroTracker with memory training contributed to significantly improved cognitive performance over memory training alone, and that more research should be conducted for elderly populations with and without cognitive deficits.



24. AI Enhanced NeuroTracker Training with Older Adults

'Artificial Intelligence models to enhance cognitive intervention in older adults with Subjective Cognitive Decline: pilot study'

[ResearchGate](#)

Aim

To investigate if a NeuroTracker intervention could improve cognitive abilities in older adults with subjective cognitive decline, and determine if AI models could be used to increase training efficacy.

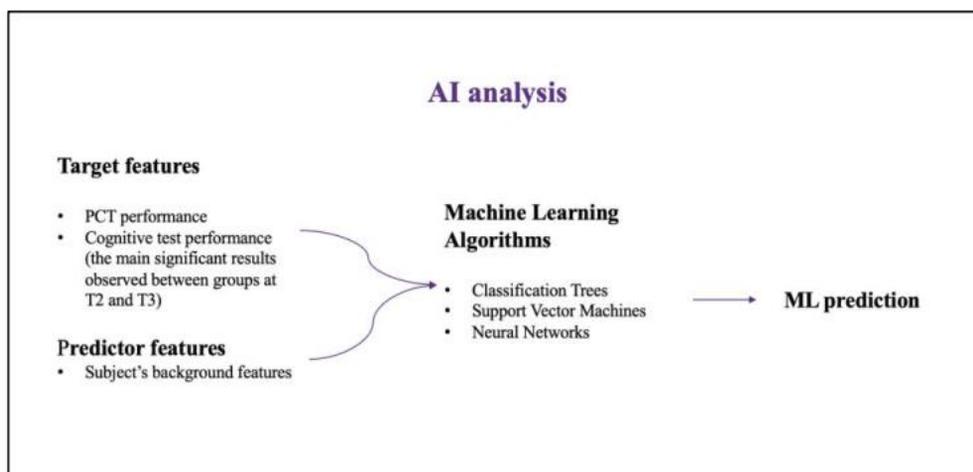
Method

48 participants between 60 and 90 years of age with subjective cognitive complaints, but otherwise healthy, were assigned to NeuroTracker training group (26) or a control group (22). All participants provided detailed socio-demographic information via questionnaires and baseline neuropsychological assessments (California Verbal Learning Test, Digit Span, D-KEFS Trail Making Test, D-KEFS Verbal Fluency Test, and Stroop Test).

The NeuroTracker group performed 7 weeks of training, the control group only performed NeuroTracker baseline assessments. Both groups performed follow-up neuropsychological assessments at 8 weeks and 11 weeks. Machine Learning models were used to analyze demographic and assessment data to test if cognitive performance and responsiveness to training could be predicted.

Findings

The NeuroTracker group experience a large improvement in scores of around 70%, along with wide and robust performance transfer on the neuropsychological assessments at week 8, with further gains (without training) at week 11. AI models yielded highly accurate predictions of responsiveness to the training intervention. The researchers propose that such models can be used to effectively tailor NeuroTracker programs to the needs of individuals.



25. Responsiveness of MS Patients to NeuroTracker Training

'The Effectiveness of 3-Dimensional Multiple Object Tracking in Patients with Multiple Sclerosis: A Pilot Trial'

[International Journal of MS Care](#)

Aim

To assess the usability of NeuroTracker for patients with multiple sclerosis (MS).

Method

16 MS patients and 9 healthy age-matched controls performed four 30 minute NeuroTracker training sessions. A battery of neuropsychological tests were performed pre- and post-training (driving readiness, Stroop, PVSAT, SDMT).

Findings

While scoring lower on NeuroTracker, patients with MS improved their scores with very similar responsiveness to the healthy controls. The training also led to significant improvements in driving readiness, showing responsiveness to the training with similar effectiveness to healthy, age-matched controls.

Figure S2. Three-dimensional multiple object tracking scores over time for each group

