

Modulation of cognitive functions using a combination of visuomotor adaptation and digital therapy in Alzheimer's disease

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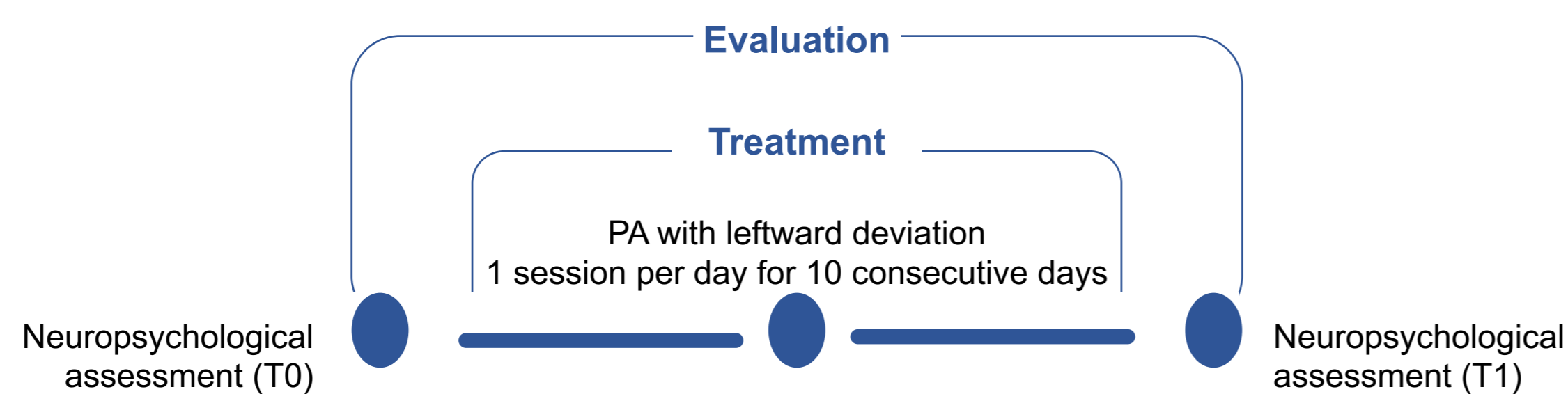
Objectives

To evaluate the effectiveness of a new medical device, MindLenses, in modulating cognitive functions in mild AD. MindLenses combines digitalized prismatic adaptation (PA) with serious games. Recent neurophysiological research indicates that PA can increase the activation of the hemisphere ipsilateral to prismatic deviation, while inhibiting the activation of the contralateral hemisphere (1).

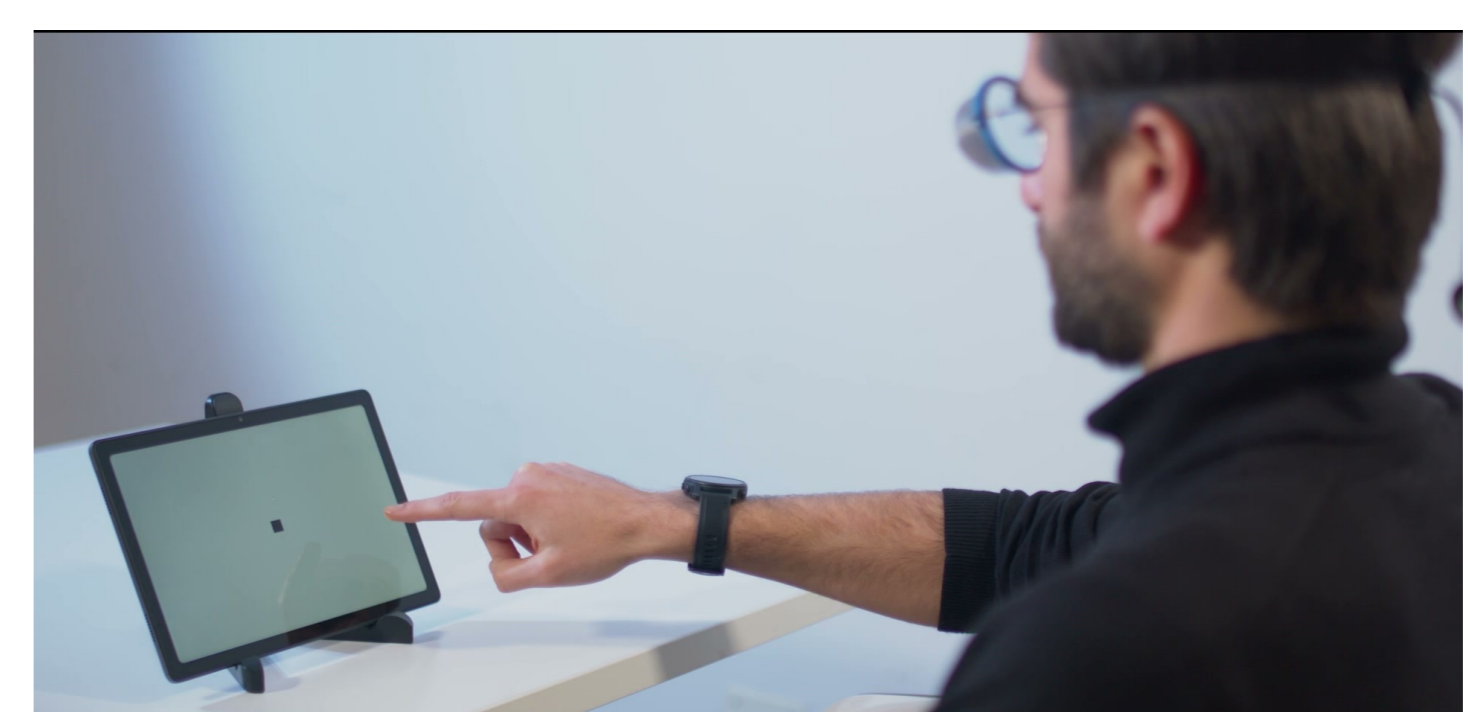
Materials and Method

Sixteen patients who met the diagnostic criteria for mild AD (9 women, mean age: 69.2, SD: 9.7 years; mean education: 10.6, SD: 6.2 years) underwent a baseline neuropsychological investigation using both Mental Deterioration Battery (MDB) and digital tasks assessing cognitive functions.

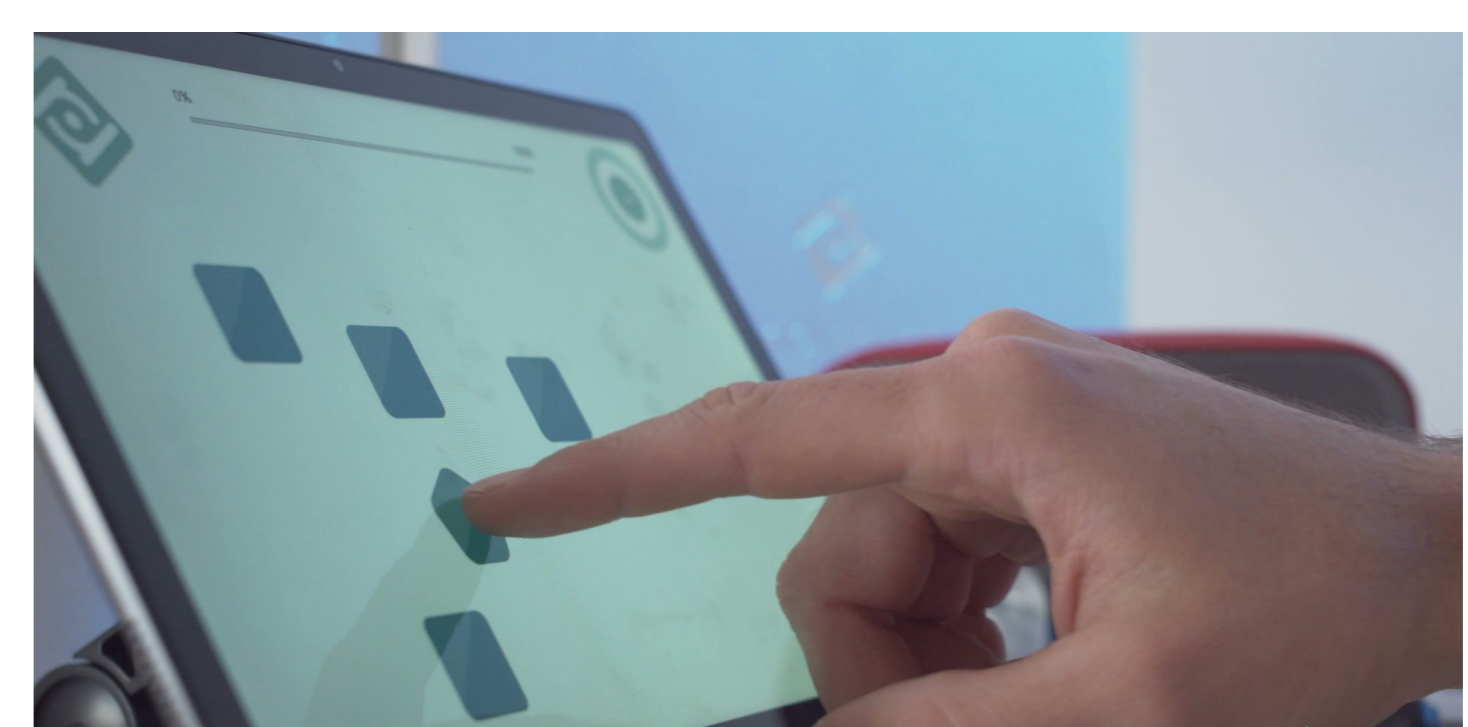
Treatment was made using the medical device MindLenses, combining sessions of leftward prismatic adaptation followed by training with serious games targeting executive functions.



Prismatic Adaptation



Serious Games training executive functions

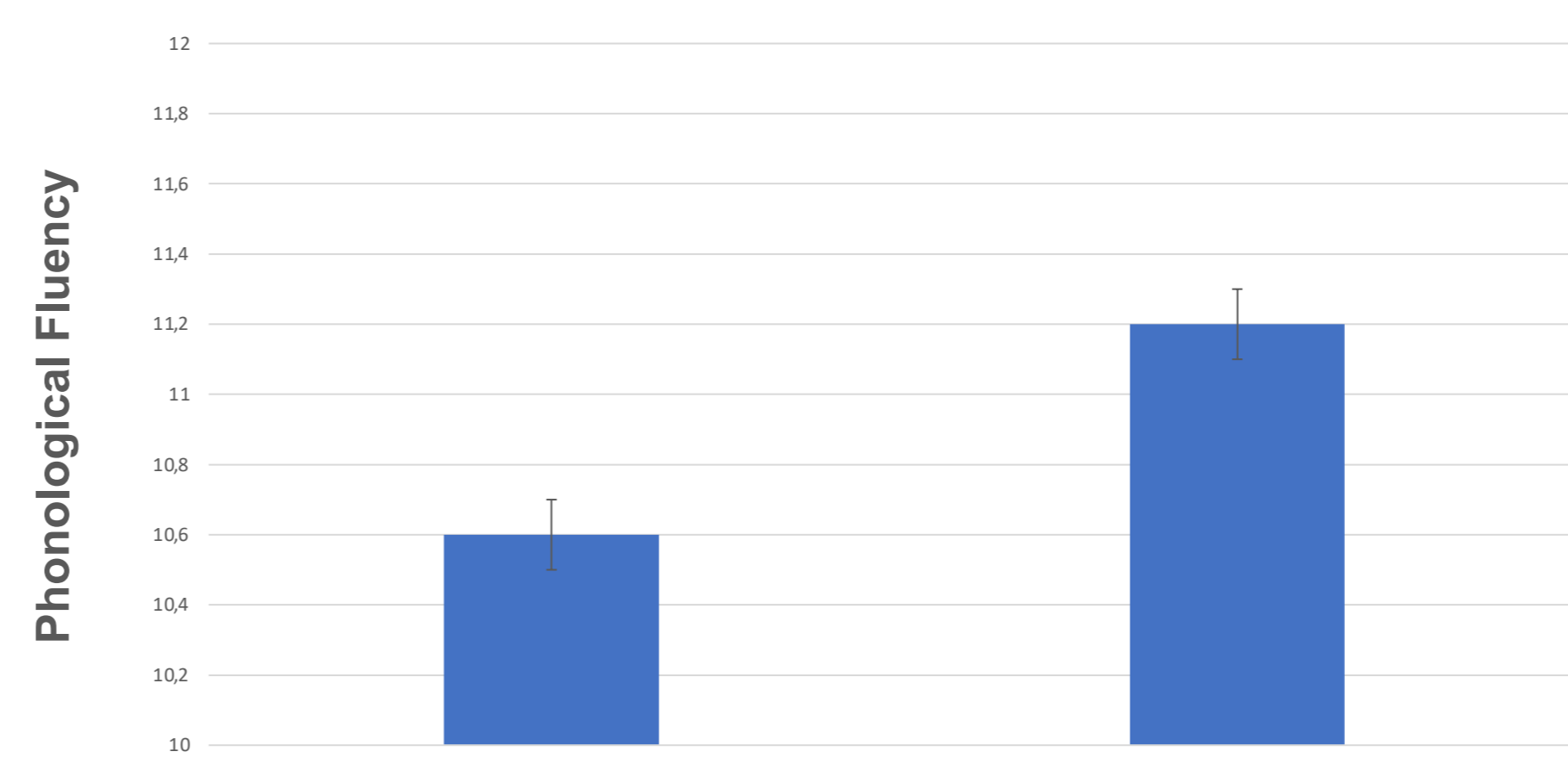


Results

Mental Deterioration Battery

	MMSE		CPM		DS-forward	
	T0	T1	T0	T1	T0	T1
mean	21,9	23,4	22,9	22,9	27,0	4,7
SD	11,0	7,9	8,6	8,6	5,1	1,6
	DS_backward		SP_forward		SP_backward	
mean	3,6	3,9	4,2	4,2	4,7	3,7
SD	1,7	1,5	0,9	0,9	1,3	0,9
	Rey_imm recall		Rey_delayed		Rey figure_copy	
mean	25,6	26,7	4,2	4,2	26,7	32,1
SD	17,7	18,4	3,3	3,0	8,5	3,5
	Figure Rey_delayed		Prose memory_immediate		Prose memory_delayed	
mean	14,0	15,9	2,2	4,7	0,0	4,0
SD	11,2	11,3	3,1	4,7	0,0	5,7

Digital task



Conclusions

The training significantly improved digital phonological fluency ($p = 0.005$) and immediate prose memory ($p = 0.03$) task of the MDB. Performance on the other neuropsychological tasks was unchanged. Results could reflect a boosting of activation of left frontal and temporal circuits, by analogy with findings suggesting frontal modulation by PA, ipsilateral to the side of prism deviation (1,2).

This pilot study suggests a new approach for modulation of executive and memory functions in AD, that hold promise in ease of use and time for producing cognitive effects. Further studies with larger patient samples, control groups and follow up monitoring will be necessary to confirm these findings.

References:

1. Gudmundsson L, et al. A brief exposure to rightward prismatic adaptation changes resting-state network characteristics of the ventral attentional system. PLoS One 2020 Jun 25;15(6):e0234382.
2. Bracco M, et al. Prismatic Adaptation Modulates Oscillatory EEG Correlates of Motor Preparation but Not Visual Attention in Healthy Participants. J Neurosci. 2018 Jan 31;38(5):1189-1201.