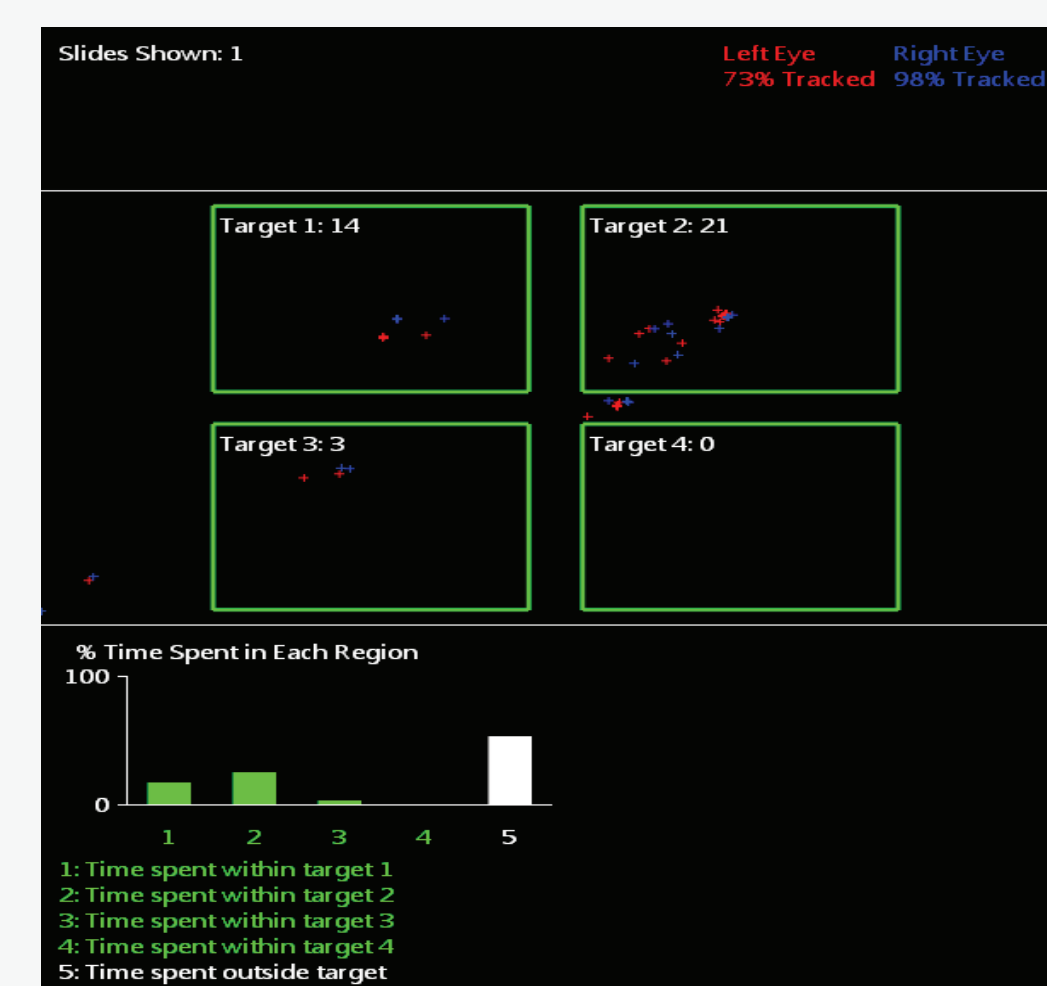


Introduction

- Depression occurs frequently in the geriatric¹ and specifically dementia² populations.
- Attentional bias towards emotionally-charged stimuli have been observed in young depressed patients.
- Using a visual attention scanning technology (VAST), which obtains real-time measurements of eye-movement patterns in the presence of competing stimuli, members of our team showed that depressed patients had increased attentional bias towards images with dysphoric themes³.
- Current assessments of mood disorders in dementia patients are hampered by deteriorating communicative ability and rely on subjective caregiver interviews.



Aim: To explore whether attentional bias towards dysphoric stimuli can be used as an objective method of measuring depressive symptoms in geriatric patients with a wide range of cognitive abilities.

Methods

- Cross-sectional study
- Alzheimer's disease (AD) and mild cognitively impaired (MCI) patients were recruited from Sunnybrook Health Sciences Centre

Table 1. Eligibility Criteria

Inclusion
<i>Cognitively-impaired</i>
✓ Diagnosis of possible/probable mild-to-moderate AD (DSM-5 and NINCDS-ADRDA criteria) or MCI (NIH criteria) with sMMSE > 10
<i>Non-cognitively impaired</i>
✓ No current diagnosis of AD or other cognitive impairments with sMMSE ≥ 26
✓ Diagnosis of mood disorder, including depression, general anxiety and bipolar disorder (DSM-5)
Exclusion
✓ Age < 65
✓ Presence/history of other neurological illnesses or traumatic brain injury
✓ Change in psychotropic medications less than 1 month prior to study day

Table 2. Neuropsychological and Psychiatric Assessments

- **Standardized Mini-mental State Examination (sMMSE):** systematic test of cognitive status
- **Neuropsychiatric Inventory (NPI):** assessment of severity and frequency of behaviour disturbances in dementia
- **Apathy Evaluation Scale (AES):** measure of apathetic symptoms
- **Cornell Scale for Depression in Dementia (CSDD):** measure of depressive symptoms in dementia
- **Conner's Continuous Performance Test (CPT):** computerized test of attention

VAST Visual Stimuli



Image series included 16 test slides, each containing 4 images of different themes (2 neutral, 1 social, 1 dysphoric), presented for 10.5 seconds each. Total test time was 20 minutes.

Primary Outcome

Relative Fixation Time (RFT): ratio of fixation duration on a specific image relative to total fixation duration of all images on a slide

Results

Table 3. Participant Characteristics

	AD (n=46)	MCI (n=8)	Mood Disorder (n=25)	P-value
Age, years	78.6 (±6.6)	77.8 (±5.3)	78.5 (±7.0)	0.899
Gender, % female	43.5%	62.5%	60.0%	0.371
Education, %				
Grade school	19.6%	0.0%	8.0%	0.578
High school	30.4%	37.5%	28.0%	
Post-secondary	26.1%	37.5%	44.0%	
Graduate	23.9%	25.0%	20.0%	
sMMSE	22.4 (±4.0)	24.6 (±3.5)	27.7 (±1.8)	<0.001*
NPI	15.5 (±12.0)	6.0 (±5.1)	8.7 (±7.7)	0.008*
AES	46.0 (±12.3)	33.3 (±12.1)	27.0 (±8.0)	<0.001*
CSDD	5.4 (±4.7)	5.8 (±4.2)	6.3 (±4.7)	0.766
CPT Inattention	542.7 (±200.9)	428.3 (±39.2)	444.7 (±68.8)	0.026*

- Groups were comparable in age, gender, education and depressive symptoms.
- AD patients had significantly worse cognition, attention, apathy, and neuropsychiatric symptoms compared with both MCI and mood disorder patients.

Table 4. Linear regression model for predictors of depressive symptoms based on CSDD scores

Predictors	B	SE B	t	P-value
RFT on Dysphoric Images	8.78	4.00	2.20	0.031*
NPI	0.29	0.05	5.88	<0.001*
Group	1.55	0.57	2.71	0.009*
AES	0.18	0.05	0.39	0.700
CPT Inattention	-0.003	0.003	-1.03	0.305

R²=0.48, Adjusted R²=0.46, F_{5,71}=13.42, p<0.001

- More severe depressive symptoms were associated with greater relative fixation time on dysphoric images, patient group and more severe neuropsychiatric symptoms.

Conclusions

- These results suggest that attentional bias towards dysphoric images can be used to predict depressive symptoms in geriatric patients.
- Greater attentional bias towards dysphoric stimuli was associated with more severe depressive symptoms, controlling for cognitive ability and neuropsychiatric symptoms.
- Measurements of visual scanning behaviour may provide a non-invasive, non-verbal and objective tool to monitor depression in geriatric patients.

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