Dementia-related visual loss: Considerations for support, environmental and device accessibility

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• Background
  – Dementia-related visual loss (diminished ‘brainsight’)
  – Posterior Cortical Atrophy (“visual variant of Alzheimer’s”)

• Informing support strategies
  – Environmental accessibility supporting navigation
  – Assistive technology facilitating reading
Visual dysfunction in dementia

• Higher order visual impairment in AD (29-40%; Mendola et al., OVS, 1995)
  – Including diminished depth perception, face perception, restricted attentional window, visuospatial impairment
  – 10-16% of 4,050 ‘typical’ late onset AD patients considered to have visuospatial, rather than memory-led presentation (Mukherjee et al., Mol. Psychiatry, 2018)

• Core features of several dementias include visual symptoms
• Visual deficits arising following initial impairment in memory or language
• Critical to living well with dementia

Trojano & Gainotti, JAD, 2016
Posterior cortical atrophy

- Progressive visual impairment in absence of ocular disorder
- Prominent atrophy of posterior brain regions
- AD most common cause despite initial sparing of memory
- Estimated 4-5% of patients in specialist clinics

Cortex thinner in PCA
-20%

Cortex thinner in typical AD
0%

20%

Crutch et al., *Lancet Neurol*, 2012; A&D, 2017

Graff-Radford, Yong et al., *Lancet Neurol*, in press
It looks like a park...
Or a station
Or a building site
Looks a bit like the thing they’re trying to elect (*sic*) for the Olympics
Or it could be the beach
Down here looks a bit sandy
Looks like Brighton or somewhere like that.

Hear clip: https://www.bbc.co.uk/programmes/p03tqgg3
Diminished vision and spatial awareness

• Visual disorientation

• Misperceiving objects in clutter

• Difficulty perceiving large objects
Visual disorientation

Video clip removed
“If things are very close together then they, sort of, combine and become unrecognisable unless I really concentrate on them. I just look at them as being a blob.”

Yong et al., *Brain*, 2014
Difficulty perceiving large vs small objects

Crutch et al., Neurocase, 2011; Yong et al., Cortex, 2014
• Informing support strategies
  – Environmental accessibility supporting navigation
  – Assistive technology facilitating reading
Aims

• Harness the perspectives of individuals with PCA to consider dementia-related visual impairment in typical AD

• Understand effects of visual environment on function in patients with PCA and typical AD

• Develop aids and strategies that compensate for the effects of dementia-related visual loss
Adaptations to support navigation and reading

• Repeated measures studies featuring N trials per participant:
  • Navigation 1: 36 trials; Navigation 2: 32 trials; Reading: 18 trials
  • Adaptation conditions counterbalanced within- and varying randomly between-participants for control for order effects
Navigation 1: Visual Cue effects

PCA/tAD (N=18; 36 trials per participant) reduced time to reach destinations [95%CI]:

- No Cue vs Contrast Cue: 12% [3, 20]
- No Cue vs Contrast+Motion Cue: 7% [-3, 15]

Yong et al., ACTN, 2018
Shadow conditions

High

Medium

No
Navigation 2: Shadow effects

Yong et al., A&D TRCI, in press

PCA (N=10; 32 trials per participant) reduced time to reach destinations, Global p=0.01 [95%CI]:
(tAD/Con Global $p=0.77/0.33$)

Medium vs High: 5% [-1, 10]
No vs High: 7% [2, 11]

Shadow conditions
Detecting hesitant steps

Yong et al., A&D TRCI, in press
Detecting hesitant steps

Yong et al., A&D TRCI, in press
The most outspoken judge on the US Supreme Court has defended the use of some physical interrogation techniques. The judge told the BBC that "smacking someone in the face" could be justified if there was an imminent threat.

"You can’t come in smugly and with great self-satisfaction and say ‘Oh it’s torture, and therefore it’s no good’," he said in a rare interview. He also accused Europe of being self-righteous over the death penalty.

In the interview with the Law in Action programme on BBC Radio 4, he said it was "extraordinary" to assume that the ban on "cruel and unusual punishment" - also applied to "so-called" torture.
Reading loss in PCA

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Reading aids

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Yong et al., Neurology, 2015
Co-design of assistive technology

Suarez-Gonzalez et al., JAD, 2019
Rare dementia support (www.raredementiasupport.org)

Our vision is for all individuals in England and Wales with or at risk of one of these rarer forms of dementia to have access to specialist information and support, and contact with other individuals affected by similar conditions.

Walton et al., BMJ, 2015
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