**Visual behavioural characteristics of patients with Alzheimer’s Disease: Observations from psychiatrists, psychiatric nurses, occupational therapists and psychiatric support workers**

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**1. Background**

Psychiatric mental health nurses, support workers, occupational therapists and psychiatrists are key professionals for supporting the mental and physical well-being of people with Alzheimer’s disease. Optimal patient-centred care requires a thorough understanding of the brain networks that underpin the behavioural characteristics typical of this condition. Structured history taking and direct observation are essential to understand the person-specific perceptual limitations. This information acts as a basis for interventions and adaptations to the person’s environment to optimise functioning and quality of life. Brain damage in Alzheimer’s disease tends to be widespread, usually starting in the hippocampus and the entorhinal cortex. Early signs are impaired function of short-term memory, word finding and reasoning skills. With disease progression, damage spreads to the parietal, temporal and occipital lobe, leading to visual difficulties and hallucinations. This is in contrast with posterior cortical atrophy (PCO) or Benson’s syndrome in which dysfunction of the visual areas of the brain occur early on. In Alzheimer’s disease, symptoms vary from blurred vision and reading difficulties to more complex presentations related to dysfunction of the ventral and dorsal stream networks (Holroyd et al. 2001; Kirby et al. 2010). Table 1 provides an overview of visual dysfunctions in Alzheimer’s disease. Reduced vision due to refractive error or ocular pathology should not be overlooked as treatment may be available, leading to better functioning and reduced frequency of hallucinations (Chapman et al. 1999). Visual hallucinations are thought to originate from pathology of the occipital lobe and tend to occur more frequently with reduced visual acuity and more severe cognitive impairment and visual agnosia (Holroyd et al. 2000; Holroyd et al. 2001; Lin et al. 2006). They vary in presentation from simple patterns to detailed images of faces, animals or places. In Alzheimer’s disease, unlike ocular visual impairment, the hallucinations may not be purely visual; some patients report hearing voices and even start conversations with the imaginary person.

This study looks at the visual behavioural characteristics of patients with Alzheimer’s disease from the perspective of psychiatric healthcare professionals who work with this patient group on a regular basis. Their observations are recorded immediately after a lecture and workshop about Alzheimer’s disease and visual perception. The session feedback also provides insight into the level of self-perceived knowledge about this topic as well as the benefit of education on the topic.

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| **Visual function (primary pathway/ occipital lobe)** | **Impairment associated with Alzheimer’s disease** |
| Visual acuity | From 6/6 Snellen in early stages to 6/120 in later stage |
| Contrast sensitivity | Reduced |
| Colour vision | Impaired in blue-violet spectrum |
| Visual fields | Lower field impairment |
| Ocular motility | Delayed saccadic eye movements |
| Stereopsis | Reduced |
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| **Ventral stream function (temporal lobe)** | **Impairment associated with Alzheimer’s disease** |
| Recognising objects and shapes | Object/ shape agnosia |
| Recognising faces and facial expressions | Prosopagnosia |
| Recognising places/ route finding | Topographic agnosia |
| Oral reading | Reduced ability |
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| **Dorsal stream function (parietal lobe)** | **Impairment associated with Alzheimer’s disease** |
| Visually guided reach | Optic ataxia |
| Simultaneous perception | Simultanagosia |
| Movement perception | Dyskinetopsia |
| Controlling purposeful voluntary eye movements | Oculomotor apraxia |
| Functioning in complex scenes | Dysfunction in cluttered or crowded places |

Table 1: Basic and higher processing visual functions in Alzheimer’s disease (Glosser et al.; Holroyd 2001; Lenoir and Sieroff 2019; Pal et al. 2013)

**2. Methods**

A group of psychiatric nurses (n=5), psychiatrists (n=3), psychiatric support workers (n=3) and one occupational therapist attended a lecture and workshop about Alzheimer’s disease and visual perception delivered at a community hospital in Scotland by the author. The lecture provided an overview of the different eye and brain structures involved in visual perception. An introduction was given about the difference between Alzheimer’s disease and posterior cortical atrophy. The remainder of the lecture addressed the visual perceptual dysfunctions associated with Alzheimer’s disease, including basic processing functions, complex visual processing and visual hallucinations. These dysfunctions were explained in the context of behavioural characteristics.

At the end of the lecture, participants were asked to write down what they had learned from the session. They were also asked to describe a case from their own practice. They were encouraged to think of a patient in their care with Alzheimer’s disease who displayed some of the visual perceptual features that were discussed in the lecture. Then, the participants discussed their cases in small groups of 2-4 people. Finally, some of the observations were discussed with the entire group, followed by a ‘Question and Answer’ session. Feedback and observations from the participants were documented.

**3. Results**

All of the participants, except from one nurse, worked with people with Alzheimer’s disease on a daily basis. The average self-reported rating of the participants about their knowledge of the topic was 4.43 before the lecture, which improved to 7.75 after the lecture on a scale of 1 to 10. Overall, the participants felt relatively familiar with the phenomenon of visual hallucinations and less familiar with all of the other visual perceptual impairments and the associated behaviours of people with Alzheimer’s disease. Figure 1 shows the topics that featured in the self-reported learning outcomes immediately after the lecture. Table 2 describes the participants’ learning outcomes in more detail. Table 3 contains descriptions of patients from the participants’ own practice.

Figure 1: Number of participants documenting learning outcomes in each subject area

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| **Psychiatrists (n=3)** | **Occupational Therapist (n=1)** | **Psychiatric nurses (n=5)** | **Health Care Support Workers (n=3)** |
| -Locations of pathways involved  -Lower visual field defect  -Reduced contrast recognition  -Disorders of vision processing  -Different types of visual difficulties in AD  -Awareness of how observed behaviours may be result of visual perception  -Impact on patients | -Frequency of lower visual filed loss: a mobility aid might be helpful  -Blue/violet colour spectrum is lost earlier  -Difference between the functions of temporal and parietal lobes in vision: ‘what’ versus ‘where’  -Distinction between visual hallucinations and psychopathy  -Importance of modifying the environment: Decluttering! | -Brain structure/functions  -Symptoms of Alzheimer’s/PCA  -Extend of visual impairment in elderly and in AD  -New terminology: re ventral stream  -Topographic agnosia: Trouble with route finding/orientation  -Prosopagnosia: Difficulty recognising faces/facial expressions  These are things I have observed, however did not know what it was called  -Learning some of the normal visual processing terms/process and how they are impacted in Alzheimer’s  -The different types of issues that would cause distress to patients that I was unaware of. I did not realise that people with eye issues and Alzheimer’s had the same issues as people with stroke and their brain  -Strategies to help patients  -Person centred care  -Emotional impact of vision impairment  -Impact on mobility/ going down stairs  -Use contrasting colours/ lighting | -All aspects of how vision works  -AD versus PCA: Subcategory or distinct  -Altered visual perception in Alzheimer’s  -Brain areas: different types of visual processing  -Tests of vision: insight into different impairments  -Ventral versus dorsal stream: specific impairments  -Visual hallucinations: eye/brain impairment or a feature of organic disease/mental illness  -Best approaches for patients  Different types of agnosia and how it affects the vision |

Table 2: Learning outcomes as reported by the participants

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| **Observation** | **Possible explanation** |
| We are probably more aware of patients with visual hallucinations as opposed to visual deficits because we are less likely to look for this (psychiatrist) | Visual hallucinations |
| 82 yo woman with Alzheimer’s, moderate cognitive impairment on formal testing but functioning relatively preserved. Issues with lower half of vision resulting in multiple serious falls, particularly outside on irregular ground. Latterly she developed visual hallucinations, some of which were distressing of threads and filaments across her cushions, furniture and bed. (psychiatrist and psychiatric nurse) | Lower field impairment AND  Visual hallucinations |
| Nursing home resident often trying to pick up imagined objects from floor (psychiatrist) | Impaired depth perception OR  Visual hallucinations |
| Person with Charles Bonnet saw furniture turning into snakes (occupational therapist) | Visual hallucinations |
| Patient would not come out of their room and walk on the shiny laminate floor; I now think they might have thought it was a river (psychiatric nurse) | Glare OR  Visual hallucinations OR  Lower field impairment |
| Patient with Charles Bonnet hallucinations. She describes animals (psychiatric nurse) | Visual hallucinations |
| Lady (94) with Alzheimer’s mistook me for her grandson: Kept making reference to my hair??  Also misidentifying others in the care home (psychiatric nurse) | Impaired face recognition/ prosopagnosia |
| Patient with visual hallucinations in the form of bears in the garden. She describes in detail “ugly big black bears and little baby bear”. She is shocked that I cannot see them. She is also visually impaired and unwilling to get eyes tested. Thankfully, she does not find this experience distressing/ upsetting. (two psychiatric nurses and support worker) | Visual hallucinations |
| Patient was finding difficulty at dining table to recognise objects, i.e. milk to put in tea: poured it onto their plate. Also now realise too many things on the table (health care support worker) | Object agnosia AND/OR  Visual field impairment AND/OR  Dorsal stream dysfunction |
| Have seen this kind of perception in patients with early onset dementia and who can be very young at times (health care support worker) | Non-specific  Likely PCA as patients young |

Table 3: Observations from participants after listening to the lecture

**4. Discussion**

The overall feedback was that participants learned a lot about the visual pathway, the specific visual dysfunctions associated with Alzheimer’s disease and their impact on functioning. After the lecture, participants were able to reflect on their own practice. Visual field impairments and agnosia’s were some of the features described. Visual hallucinations were frequently observed and the overall feedback was that the discussion not only improved their understanding of this phenomenon, it also empowered them in terms of understanding how to support their patients who experienced hallucinations and other visual perceptual dysfunctions. It would be interesting to know if more visual behavioural characteristics are recognised when the participants return to their practice with the newly acquired insights. Unfortunately this feedback was not available on this occasion.

Assessment of visual perception in people with Alzheimer’s disease and other types of dementia can be a challenge for health care professionals who have daily responsibility for those patients. Understanding visual processing does not tend to be part of their core competencies. Although ophthalmologists and optometrists are familiar with ocular pathology and to a lesser extent pathology of the visual pathway of the brain, it is not common for these professionals to manage the functional impact of these conditions.

The participants of the session welcomed the idea of an accessible tool for health care workers for the assessment and management of visual behavioural characteristics for people with dementia.

**6. Limitations and next steps**

This study documented observations from a small group of professionals working in psychiatric care. In order to form a more accurate impression of the level of knowledge and to get a better representation of their observations, a larger study is required. In this study the feedback was obtained immediately after the session. In order to measure if such a session causes a real benefit to patient care, a study is required whereby the participants are asked for more feedback over a longer period of time. Although the observations from this study provide some insight into the observed visual characteristics in people with Alzheimer’s disease, a logical next step would be to observe patients directly and obtain further insight through detailed history taking with close relatives. Increased understanding of the visual processing dysfunctions associated with dementia and the characteristics of patients with different types of dementia can form the basis of a future assessment and management tool.

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