

Project Details	
Project Code	MRCNMH25Ex Huntley
Title	What is it like to have advanced dementia? Using remote measurement of EEG and physiological markers of sleep, arousal and awareness in people with advanced Alzheimer's disease.
Research Theme	Neuroscience & Mental Health
Summary	What is it like to have advanced dementia? How do changes in sleep and awareness impact the behaviour and quality of life of people living with advanced dementia? How can we be sure that our interventions are making a genuinely positive difference? This PhD project will address these fundamental questions by translating recent breakthroughs in cognitive neuroscience to improve understanding of sleep disturbance, awareness, and the care needs of people with advanced dementia. It will use state-of-the-art EEG, physiological and behavioural biomarkers of sleep, awareness, and emotional response to provide a unique understanding of advanced dementia.
Description	<p><b>BACKGROUND:</b></p> <p>Sleep disturbance and fluctuations in awareness and arousal are common in dementia, particularly in advanced dementia. These include excessive daytime sleepiness, sleep fragmentation, sundowning, apparent fluctuations in consciousness and disrupted circadian rhythms. Sleep disturbance causes significant challenges and distress to patients and carers. It is associated with behavioural and psychological symptoms (BPSD) including agitation, apathy and wandering, and reduced function and compliance with activities of daily living. It can be very challenging for carers to manage sleep disturbance, with night-time wandering and daytime apathy associated with the need for people with dementia to move into residential care.</p> <p>Unfortunately, people with advanced dementia living in care homes are often under stimulated, spending large periods of time in their rooms with limited social contact or engagement. In communal areas people are often left to sleep in chairs and this may even be encouraged as it may reduce demands on under resourced and overworked carers. However, does this represent good care, or good quality of life and wellbeing for people with dementia? A number of fundamental questions require urgent answers:</p> <ul style="list-style-type: none"> <li>• Is sleep disturbance an inevitable feature of advanced dementia?</li> <li>• Are changes in level of arousal simply related to sleep or are epileptic phenomena being routinely missed?</li> <li>• Is there variability and precipitating and perpetuating factors that could be the target of interventions to manage sleep disturbance, BPSD, and improve quality of care and quality of life and wellbeing for people with dementia and their carers?</li> <li>• It is also unclear why and how changes in sleep occur with progression of dementia into the severe and end of life stages, and whether sleep markers could be used to personalise care, predict end of life or BPSD and measure sleep interventions.</li> </ul> <p>It is not feasible to investigate sleep formally in an in-laboratory polysomnographic study, as many people living with advanced dementia in care homes may be bed-bound or housebound and may find the</p>

experience of a lab investigation disorientating and distressing. Recent development of portable, wireless EEG devices now allow high quality EEG recordings to be made in a real world setting, and many of these devices are specifically designed to be comfortable, unobtrusive and worn to measure sleep. This now allows an accurate assessment of macro-architectural parameters, sleep staging and identification of micro-architectural measures of sleep in care homes. In a pilot study we have demonstrated that the use of simple wireless EEG monitoring is feasible and acceptable to people with advanced dementia, families and professional caregivers. In addition, advances in wireless technology allow data to be captured remotely in real time and time series analyses enable sophisticated measurement not only of sleep architecture, but markers of neuronal complexity and awareness.

There is now potential to use these devices for the first time to answer crucial clinical questions about the nature and extent of sleep disturbance and awareness in people with advanced dementia in care homes.

**AIMS AND IMPORTANCE:**

This exciting, novel and clinically important PhD project will translate state of the art remote EEG recording and data analysis to answer fundamental clinical questions in people with advanced dementia, The project aims to:

- 1) Measure characteristics of sleep and physiological rhythms in individuals with advanced AD, particularly micro-architectural measures of sleep, relationship between sleep parameters, physiological rhythms, wellbeing and BPSD, including apathy and agitation.
- 2) Monitor the micro-architecture of fluctuations in arousal seen during the day? Can these fluctuations be predicted?
- 3) Identify whether external stimuli (e.g. music, spending time with others, environmental factors) are associated with changes in sleep and arousal in order to identify potential targets for interventions.

**METHODS:**

The study will recruit 60 people with dementia living in care homes. Thirty people will be at the mild stage of dementia (sMMSE >18; GDS 1-2) and thirty will be at the advanced stage of dementia (sMMSE < 10; GDS 5-7).

Participants will wear a small, portable, wireless EEG headband for 24 hours. They will also be asked to wear a watch that will measure physiological data including heart rate, galvanic skin response and actigraphy.

During the 24 hour period, there will be two 1 hour sessions of observation and introducing various stimuli including enjoyable music and activities.

Of note, the study will enable a highly novel and rich EEG and physiological data set to be collected from people with advanced dementia. There will be flexibility for the student to follow their own research interests and adapt the design of the observation and stimulation sessions, or consider additional data collection and analyses under supervision, and this will be a highly collaborative study enabling the student to learn a range of clinical, data analytic and neuroscience skills.

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