Brain and Heart Health (Vascular Ageing) Projects

1. Project title: Evaluating International stroke - Face Arms Speech Time to Act Fast (FAST) campaigns and their impact for facilitating health literacy across diverse global regions

Project outline

Stroke is the second commonest cause of death and the sixth leading cause of disease burden globally with an estimated 6.5 million stroke deaths annually, expected to rise to 8 million by 2030 (World Stroke Organisation, 2022). The average stroke destroys roughly two million brain cells every minute. Therefore, the quicker a person gets into hospital after sustaining a stroke, the more brain tissue that can be salvaged. The Face Arms Speech Time to Act (FAST) campaign was created to increase public and community awareness to rapidly recognise when a stroke is taking place and to act quickly to get medical treatment and prevent serious damage. FAST campaigns have been reported to improve public awareness regarding the general signs and symptoms of stroke and to seek emergency medical assistance urgently. However, findings from some studies have reported that many older adults may not recognise early symptoms of stroke in themselves or others and that they may lose vital time in presenting for medical attention. The aim of this research project is to identify how health literacy is facilitated in existing FAST campaigns that have been rolled out in various countries globally; and to determine how these campaigns may be improved upon to include health literacy levels of all populations recognising various diversities e.g., age, language, culture, and ethnicity. Ongoing improvement of public awareness regarding stroke warning signs and risk factors continues to improve chances for recovery and reduce disability, mortality, and morbidity from stroke.

For a culturally focused FAST campaign, see:
https://www.youtube.com/watch?v=tZfaOoVEG9g&list=PL91D2BD704EFF967B

https://www.linkedin.com/pulse/producing-first-arabic-fast-stroke-awareness-video-bahrain-rizk

Research priority area: Stroke and associated cerebrovascular disease, health assessment

Project level: PhD

Supervisor(s): Professor Claire Donnellan et al.

Project start date: Ongoing

2. Project title: **Hypertension and cognitive screening for intracerebral haemorrhage prevention**

Project outline

Intracerebral haemorrhage (ICH) or haemorrhagic stroke is defined as bleeding within the brain parenchyma and occurs without trauma or known bleeding causes such as an arteriovenous malformation, cerebral aneurysm, or tumour. ICH accounts for at least 10-15% of all strokes and is even higher pending ethnicity and global distribution. The overall incidence of ICH is reported to range between 15 to 40 cases per 100,000 and may be higher in Asian populations and in individuals over 75 years. ICH can be classified by its location and is referred to as lobar (15%-30%), deep (35%-70%) and infratentorial (10%-20%). Lobar ICH involves haemorrhages

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located in cortical-subcortical areas and deep ICH being located within the basal ganglia and internal capsule. Infratentorial ICH is sometimes classified under deep ICH and involves the brainstem and cerebellum. Regarding aetiology, lobar ICH, is caused by several distinct diseases with cerebral amyloid angiopathy (CAA) being the most common and refers to abnormal aggregations of beta amyloid deposits that form in the walls of cerebral arteries, arterioles and capillaries and is considered responsible for increasing bleeding risk and cognitive impairment. The most frequent cause of deep ICH is deep perforating vasculopathy with hypertension being the most important risk factor. With the highest proportion of haemorrhagic strokes caused by undetected hypertension and mild cognitive impairment, there is a dire need for a hypertension and cognition screening protocol to be rolled out in regions including low- and middle-income countries where ethnic minority groups are predisposed to the greatest risk of sustaining haemorrhagic stroke. The aim of this research is to develop greater awareness for blood pressure and cognitive screening among health professionals and to monitor at risk groups for haemorrhagic stroke in addition to ischaemic stroke. A specific objective will focus on developing a screening index inclusive of cognitive scoring and blood pressure measurement using a machine learning algorithm, for detecting and targeting at high-risk groups for stroke, mild cognitive impairment, and other associated diseases of vascular ageing.

For further reading, see

Donnellan, C., Werring, D. Cognitive impairment before and after intracerebral haemorrhage: a systematic review. *Neurol Sci* **41**, 509–527 (2020). https://doi.org/10.1007/s10072-019-04150-5

For further reading, see

Donnellan, C., Werring, D. Cognitive impairment before and after intracerebral haemorrhage: a systematic review. *Neurol Sci* **41**, 509–527 (2020). https://doi.org/10.1007/s10072-019-04150-5

Research priority area: Stroke and associated cerebrovascular disease, health assessment, socioecological determinants of health (health literacy, health disparities, cultural competence,

Project level: PhD

Supervisor(s): Professor Claire Donnellan et al.

Project start date: Ongoing

3. Project title: Identifying neuropsychological and biomarker evidence of the emotion-cognition interaction from healthy ageing and mental health conditions, comparing to neurodegenerative and cerebral vascular disorders.

Project outline

Neurodegenerative and cerebral vascular disorders continue to challenge our understanding of neuroplasticity, focal localisation, and connectivity from clinical and neuroscientific perspectives. For example, the neuroimaging evidence to date, regarding stroke recovery has tended to focus specifically on motor and/or functional aspects including language recovery, providing anatomical markers of lesion location and size and subsequent function. More recently there has been increasing interest in both structural and functional connectivity approaches in understanding stroke recovery (1, 2) with the emphasis also on motor recovery (3). The human connectome project (4) has given rise to understanding brain connectivity in more detail and has facilitated investigation into structural and functional connectivity from a network perspective in healthy ageing (5) and also for neurodegenerative disorders (6) and neurological disorders post stroke (7-9).

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The mechanisms underlying emotion-cognition interactions in healthy brain functioning have been well established from neuroimaging modalities' evidence (10). However, from studies investigating changes to the ageing brain, the evidence of this interaction is less well known (11), especially following age-related associated diseases such as dementia, cerebral small vessel disease and stroke. The aim of this research is to identify and establish what happens to the cognition-emotion interaction following neurodegenerative and cerebral vascular disorders using neuropsychological assessment and multimodal neuroimaging techniques including connectivity evidence where available. Neuropsychological and neuroimaging evidence of the emotion-cognition interaction will be identified from healthy ageing studies and these in turn will be compared to studies investigating cognition and mood in neurodegenerative and cerebral vascular disorders.

This project is ideal for a nursing candidate that may have a strong interest in cognitive and psychological health of older adults with a particular interest in neuroanatomy and physiology. Full training will be provided on reviewing relevant neuropsychological and neuroimaging evidence for the purposes of the research work.

References

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11. Grady C. The cognitive neuroscience of ageing. Nature reviews Neuroscience. 2012;13(7):491-505.

Research priority area: Mental health, healthy ageing, chronic conditions, Stroke and associated cerebrovascular disease

Project level: PhD

Supervisor(s): Professor Claire Donnellan et al.

Project start date: Ongoing

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4. Project title: Nurses assessment of cognitive function and evaluation of protocols for cognitive screening in older adults

Project outline

Cognitive functioning is the intellectual activity that includes mental processes, such as, attention, processing speed, learning and memory, executive function, verbal fluency, and working memory. Cognitive change is a normal process of ageing and requires detailed assessment of older adults' specific cognitive abilities and understanding of the person holistically. Some cognitive abilities, such as vocabulary, are resilient to brain aging and may even improve with age. Other abilities, such as conceptual reasoning, memory, and processing speed, decline gradually over time. The aim of this project is to examine nurses' understanding and involvement in assessment of normal and abnormal cognitive function in older adults. For example, nurses' awareness of when age-related cognitive changes begin and how these changes differ from neurodegenerative and vascular pathological brain changes. This project will involve determining all modalities of assessment to include observational, objective, and subjective reporting and measurement of cognitive function used by nurses in healthcare settings.

The masters by research student will be assigned a specific method and focus of the projects in alignment with their experience and interests.

Research priority area: Health assessment and technology including clinical guidelines, healthy ageing

Project level: MBR

Supervisor(s): Professor Claire Donnellan et al.

Project start date: Ongoing

5. **Investigation into availability, feasibility, and effectiveness of education technologies (learning management systems, elearning platforms and etools) focusing on cognitive, emotional, and behavioural health of older adults (CEBOHA) - addressing training and educational needs of residential and long-term care sector audiences.**

EdTech Development of Cognitive, Emotional and Behavioural Health of Older Adults (CEBHOA) The focus of this research is to identify the gaps in health professionals' knowledge and skill set (competencies) for screening, assessing, and managing cognitive, emotional and behaviour health in older adults (CEBHOA) with specific reference to residential long-term care settings. This work will be part of the first phase for a larger Edtech development on training health professionals (i.e., nursing personnel and allied health) in CEBHOA. This Edtech development will have particular importance to health professionals with no prior graduate qualifications or specialisation in gerontology, old age psychiatry, gerontological and/or mental health nursing.

The aim of this proposal is to review and examine availability, feasibility, and effectiveness of all available education technologies (learning management systems, elearning platforms and etools) focusing on cognitive, emotional, and behavioural health of older adults (CEBOHA) and to address the training and educational needs of health professionals working in residential and long-term care settings.

The specific objectives for this proposal are to:

- Conduct a comprehensive systematic review(s) of all available online education resources on cognitive, emotional, and behavioural health of older adults relevant for health professionals working in the aged care sector.

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