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Start Date: 1 February 2009
Approval Date: 11 August 2009
Submission Date: 2 February 2012
Extended submission date: End of 2012
Hand in date: 30 December 2012

Title

The Thalamus in Parkinson's disease: a multimodal investigation of thalamic involvement in cognitive impairment.

Research Objective and Design

Our initial aim was to identify neural correlates of cognitive decline in Parkinson's disease and provide a method of identifying those at risk of later dementia whilst they were still in the early stage of illness. We focussed on the thalamus as an integral influence on cognition as this subcortical region has many reciprocal connections with the cortex and is centrally located in the brain. Analysis was cross-sectional between three Parkinson's disease groups and an age and education matched control group. Imaging modalities included the standard magnetic resonance structural imaging, advanced diffusion tensor imaging and voxel based morphometry.

Hypothesis and Methods

Throughout my PhD I had been working to general hypotheses. These were finalised into concrete, specific hypotheses during 2012 and are as follows:

1. That the thalamus will reflect cognitive dysfunction in Parkinson's disease
2. That individual regions of the thalamus will be differentially involved in Parkinson's disease and reflect cognitive dysfunction
3. That cortical connectivity will be disrupted between the thalamus and the cortex in Parkinson's disease and contribute to the breakdown in cognitive systems

Progress to since last report (5th October 2011)

At the time of the last report data collection had just been completed and preliminary data analysis was underway. At this stage my submission date remained 2 February 2012. After feedback was received on initial sections of chapters and after consultation with my primary supervisor we decided I would take all available extensions that were granted to Canterbury University students as a direct result of the ongoing earthquakes. Extensions were cumulative and I was thus granted until the end of 2012 to complete my PhD. It should be noted that as my scholarships were not similarly extended I was no longer a funded student and, as a direct result of this was heavily engaged in teaching commitments for all of 2012.

During the remainder of 2011 and the beginning of 2012 my sole focus was on completion of data analysis and writing of the results sections for each study chapter (4 in total). During this time I also worked on my literature chapters and my methodology chapters. Write up began in earnest in June of 2012 and various chapters were complete in note form by the end of this month. One of my literature chapters (thalamic nuclei) was complete at the end of this month and submitted to my primary supervisor for feedback. By mid July, the results section of the thalamus chapter was also submitted for feedback.

During the month of August I presented aspects of my research at the College of Science final and the University final of the 'PhD in 3' competition held on the 10th and 22nd

of August respectively. On the 26th August I presented aspects of my work at the Australasian Winter Conference on Brain Research, held in Queenstown. Upon return to Christchurch I was notified by the media consultant at Canterbury University of the interest generated by my research during the 'PhD in 3' series. At the end of August my biggest study chapter on the thalamic nuclei was complete and was with my primary supervisor awaiting feedback.

For the majority of September and October I participated in various media engagements, including an interview with the Christchurch Press, with the local student lead radio station at the Christchurch Polytech and with TV3's media liaisons. By mid September the results section of my final study chapter (thalamic-cortico connections) had also been submitted to my primary supervisor. Within a few days of submitting I received complete and detailed feedback on my thalamic nuclei study chapter and the results section of my thalamic-cortico connectivity chapter which I continued to work on in conjunction with my technical advisor and my primary supervisor. At this point we decided on a better format for the results section so all other results section were updated in order to keep the PhD consistent.

During October I was invited to speak as part of the 'What If' lecture series to be held during November on campus. I spent the remainder of the month and most of November working on this presentation. During October and November I continued to work on my study chapters, although no further feedback was received on these. At the end of October I had submitted my methodology chapter to my primary supervisor after extensive consultation with the research assistant (Leslie Livingston) at the New Zealand Brain Research Institute and two others (Charlotte Graham and Toni Pitcher) who had been working with the patient cohort.

During the end of November and through December I finalised my additional chapters (4 in total) and submitted them to my primary supervisor as they were completed and proofed by myself. My complete whole thesis was left on my supervisor's desk on the final day our institute was open as normal (19th December). My thesis was submitted to the University of Canterbury on the 30th December 2012.

Timetable for the Next 6 Months

My thesis is currently awaiting examination, I expect I will complete my defence in the next 6 months and am aiming to graduate in December. Prior to my defence however I hope to publish articles relating to my research. Three of these are currently in various forms of completion but as yet, have not been submitted for peer review.

Acknowledgements

The financial burden of a PhD is a significant undertaking, not helped by especially trying circumstances surrounding the geological uncertainty in Canterbury. The burden was made significantly lighter in 2010 by the New Zealand Federation of Graduate Women Sadie Balkind Award and in 2011 by the Todd Foundation Awards for Excellence (Universities) and the Ray Newton Scholarship, which was awarded by the Canterbury Medical Research Foundation in 2011. To Mr. Newton, especially, it was a huge honour to have you sponsoring my research and your support and humour were a constant inspiration to me. I appreciate everything that your input enabled me to achieve. Every year of my PhD I have also been lucky enough to travel internationally or domestically to conferences due to sponsorship from the University of Canterbury and the Neurological Foundation. For this break from research and the opportunity to meet others in my field, I thank you.