LAIDLAW SCHOLARS

# Laidlaw Scholars Undergraduate Leadership and Research Programme
## Record of Reflection

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STUDENT LIFE | Centre for International Experience

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## Laidlaw Research Summer Reflection

This past summer, I had the privilege of working on a research project investigating the use of transcranial direct current stimulation (tDCS) for the treatment of neuropsychiatric symptoms of Alzheimer's disease. Stepping into the project, I was not fully sure what to expect. While I had some experience with data analysis through previous university coursework and research projects, I had never worked directly with patient data in a clinical research setting. I was immediately aware that working with this type of data carried responsibilities that went beyond simply conducting an analysis. The data represented real people living with Alzheimer's disease, as well as the experiences of their families and caregivers. I therefore knew that I needed to be particularly careful not only in how I handled and analysed the data, but also in how I interpreted my findings and the conclusions I drew from them.

Since I was working with data that had already been collected through a clinical trial conducted by my advisor, Dr. Sanjeev Kumar, and his team in the Geriatrics Division at the Centre for Addiction and Mental Health, much of my work at the beginning of the project involved understanding the clinical trial protocol and how the data had been collected, coded, and processed. This was an important learning experience because I initially approached the dataset with the mindset that I could simply begin analysing the variables that seemed most interesting. I quickly learned that meaningful analysis requires a much deeper understanding of where the data came from and what each variable actually represents. A number in a dataset is not meaningful in isolation; it reflects a particular measurement, collected at a particular time, under a particular protocol. In these early stages, I realised just how important it is to clarify rather than make assumptions. At the same time, I learned how to balance seeking guidance from my advisor and other members of the research team with working independently and troubleshooting problems on my own whenever possible.

As my project progressed, my research focus shifted from trying to understand the dataset as a whole to narrowing my attention onto specific variables, measures, and outcomes that were most relevant to my research questions. Although I had specified goals in my original research proposal, examining the data made me realise that even these goals were too broad. I needed to narrow my questions considerably in order to conduct an analysis that was both meaningful and achievable within the limited timeframe of the Laidlaw research period.

This was challenging at first. Having access to such a large amount of clinical and EEG data made it tempting to investigate everything at once. Choosing one outcome to focus on often felt like closing the door on all the other possibilities. However, this experience taught me one of the most important lessons I took away from the project: prioritisation is an essential part of research. While broad and ambitious goals can initially sound more impressive, specific and achievable questions are much more conducive to producing meaningful results. Good research is not necessarily about answering the greatest number of questions; sometimes it is about asking one carefully defined question and answering it well.

As someone who often finds myself trying to do more and more, this was a particularly difficult lesson to learn. I had to accept that unless I narrowed the focus of my project, I might ultimately fail to complete anything meaningful. It was through this process that I came to appreciate that,

in research, less really can be more. A narrower research question allows for greater attention to methodological decisions, data quality, statistical analysis, and interpretation. Rather than viewing narrowing my project as giving something up, I began to see it as a way of making the work I did choose to pursue more substantive.

I ultimately decided to focus much of my analysis on the clinical data component of the study, particularly the Neuropsychiatric Inventory-Clinician rating data. I chose these measures because they were well documented in the dataset and provided a clear starting point for understanding changes in neuropsychiatric symptoms over the course of the intervention. I also focused on global LICI measures when examining the EEG component of the study, rather than immediately attempting to analyse data from every individual electrode. While I would eventually like to continue this work by examining more detailed EEG outcomes and relationships between cortical inhibition and clinical improvement, I recognised that doing so comprehensively would extend well beyond the scope of the six week research period. Learning to distinguish between what I would like to investigate eventually and what I could realistically investigate was vital.

Another significant part of the project was learning to become more comfortable with uncertainty. Research rarely progresses in the perfectly linear way that it can appear to when described after the fact. I encountered questions about the dataset, unexpected patterns in the data, analytical decisions that required reconsideration, and situations where I was unsure whether an approach was appropriate. Instead of seeing these moments as signs that I was doing something wrong, I began to understand them as an inherent part of the research process. I learned that being a good researcher does not mean always knowing what to do next. It means being willing to recognise what you do not know and then seeking out the information necessary to move forward.

Working on an Alzheimer's disease-related project was especially meaningful to me because it allowed me to reflect more deeply on the areas of neuroscience research I would like to pursue in the future. Although I had previously been interested in dementia and Alzheimer's disease, I did not fully appreciate just how rewarding and important this area of research could be. Memory is fundamental to how we understand ourselves and our relationships with others. Watching memory gradually deteriorate in someone you love can be an incredibly painful experience, particularly when it is accompanied by changes in personality, behaviour, and a person's sense of identity. Alzheimer's disease does not only affect the individual diagnosed; it also profoundly affects families, caregivers, and communities.

At the same time, this project helped me think about Alzheimer's research in a way that extends beyond the search for a cure. While developing treatments that can slow or prevent disease progression is critically important, there is also enormous value in research aimed at improving quality of life for people who are already living with dementia. Neuropsychiatric symptoms such as agitation and aggression can be particularly distressing for both patients and caregivers. Working on a project investigating whether a relatively accessible intervention such as tDCS could help alleviate these symptoms made me realise that there are many ways neuroscience can contribute to patient care. Even when a treatment does not fundamentally change the course of a disease, improving a patient's daily experience and reducing the burden placed on caregivers can have meaningful consequences.

As I look toward the future, whether considering a career in research or even my next summer's Leadership in Action project, I am eager to continue exploring what I can do to help people affected by Alzheimer's disease and other neurological conditions. This project strengthened my interest in neuroscience, but it also taught me lessons about research that extend far beyond Alzheimer's disease or any particular method of analysis. I learned the importance of asking questions, being willing to narrow my ambitions, working independently while knowing when to seek help, and treating research findings with the care and humility they deserve.

Most importantly, this experience reminded me why I want to pursue research in the first place. Behind every dataset are people whose experiences give the numbers actual meaning. As I continue my education and research career, I hope to keep this perspective at the centre of my work. I want to contribute not only to our scientific understanding of neurological disease, but also to building healthcare systems and communities that are supportive, respectful, and welcoming of people living with dementia and their caregivers.