Daniel Gale has a strong passion for research and statistics

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By Queen’s Psychology
Photo by Eric Brousseau

Queen’s Psychology 4th year undergraduate student Daniel Gale has a strong passion for research and statistics. Dan currently works in the Cognition and Action Lab with supervisor Randy Flanagan.

“When I first arrived at Queen’s, I knew I wanted to study the human brain. Psychology is an incredibly diverse field and exploring the human brain with a variety of perspectives really drew my interest,” explains Dan. “I liked that the Queen’s Psychology program had several volunteer opportunities for students who were interested in research. So, when I really enjoyed my experience in PSYC 100, I decided that psychology was the area I wanted to pursue”.

As Dan progressed though his Queen’s undergraduate program, he enjoyed the psychology program’s emphasis on foundational knowledge in research methodology and statistics. “Because I like statistics and data analysis, I wanted to pursue research that involves sophisticated data processing and analysis with lots of opportunities for exploring large and interesting datasets,” Dan says.

As a result of exploring his love for data analysis, Dan became interested in movement research which involves recording complex, time-varying kinematic and force variables and thus affords ample opportunity for exploring and analyzing patterns in the data. “Movement research also provides a controlled experimental setting that allows us to precisely manipulate parameters for clear cause-and-effect experiments”, Dan suggests. ‘Furthermore, movement research can involve a wide variety of computational approaches, which also piques my interest”.

Dan’s thesis examines how we make decisions with respect to our learning. In other words, Dan is interested in how we translate information about our learning performance (such as how quickly and how well we are learning) into decisions and predictions about our future performance. He is examining this in the context of learning a new motor skill. During the study session participants will learn a task and then must make a decision related to how their future performance will be rewarded; choosing between a high risk option, in
which good performance is handsomely rewarded but poor performance is unrewarded, and a low risk option in which poor performance is rewarded at a low rate and good performance is rewarded only a little more.

“Essentially, this decision asks individuals how much they’re willing to invest in their own learning, and we will often face this situation in everyday life”, Dan explains. “For instance, imagine that you decide to learn (and hopefully master) something new such as linear algebra or the guitar. After some time, you might ask yourself whether it is worth it to continue investing time and effort to the task. In order to make this decision, you will likely have to take into account your learning ability, how much time you have to learn the task, and the ultimate benefits of mastering the task”.

Because no study to their knowledge has looked at learning in this way, Dan is looking forward to analysing the results. “Some previous research has shown that we can make smart decisions about how to move, so as to minimize risk of penalty during arm reaching tasks”, Dan affirms. “So we might predict that we may also make smart decisions about learning a new motor skill”.

Dan hopes his research will improve our knowledge about how humans make decisions during learning. “If we find that we’re pretty good at making decisions when learning a new skill, this might encourage individuals to reflect on their own learning and to have more confidence in their decisions because they are generally making smart choices,” Dan suggests. “However, if we discover that we might not be best at making these types of decisions, this might encourage us to continue learning something new even if we struggle with it early on and feel like it is no longer worth it. Either way, we might find results that help individuals learn more difficult skills and tasks”.

Dan is excited to be a part of the Cognition and Action Lab. There are currently several ongoing projects, exploring a variety of areas involving movement and cognition. Any given project can include object manipulation, virtual reality environments, fMRI and/or transcranial magnetic stimulation (TMS). Having such a diverse experimental toolbox with state-of-the-art technology has allowed Dan and his colleagues to pursue many research questions with multiple perspectives and advanced methodology.

Looking forward, Dan would like to pursue work involving big data and statistics. “The Queen’s Psychology program gave me with experience in statistics, research design and computer science. Carrying out a thesis and participating in several other research projects in various labs has allowed me to apply and expand upon what I learn in the classroom”, Dan confirms. “As a result, I have developed a knowledge base and a strong passion for research and statistics. I find that the more I learn, the more I want to learn”.

“Today’s world produces an immense amount of data on a daily basis and there are huge opportunities for individuals who can process, organize, interpret, and communicate this complex information,” Dan concludes. “My thesis has given me an opportunity to explore these skills, whether it be crunching 15 million rows of raw data or communicating ideas and results effectively with colleagues. Indeed, motor research is exciting not only because of the research questions involved, but also because of the quantitative skills you develop. Moreover, I think entering industry or academia with a psychology background is enormously beneficial as it also fosters communication, organizational, and critical thinking skills”.