Developing the credibility of psychological science: Graduate student reflections on open science

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Developing the credibility of psychological science: Graduate

Johannes Alfons Karl, Amy Walsh, Kealagh Robinson, Sam Twitchin

Johannes Karl is a PhD student in psychology neuroscience at Victoria University of Wellington, supervised by Prof. Ronald Fischer. His PhD focuses on understanding individual differences in mindfulness and identifying potential sources of those differences. Besides his PhD work he is actively working on method development for cross-cultural comparisons and novel approaches to collecting environmental and physiological data using open source hardware.

Amy Walsh is a PhD student in cognitive and behavioural neuroscience at Victoria University of Wellington, supervised by A.Prof. Gina Grimshaw. She has handed in her PhD thesis and is waiting for her oral defence. Her thesis examined how we pay attention to emotional information. More specifically, whether and how we can ignore emotional distractions when we want to. She is currently working in several different psychology labs at Victoria, examining how we look at faces, and our brain and body's emotional responses. She is looking for a post-doctoral position overseas.

Kealagh Robinson is a PhD student at Victoria University of Wellington, supervised by Prof. Marc Wilson and A.Prof Gina Grimshaw. Her work focuses on how people generate, interpret, and regulate their emotions. Her PhD thesis examines how adolescents who self-injure respond to emotional challenge, and how this response then relates to their subsequent mental health.

Psychology has challenges to the validity of its findings over the last years, from inflated effect sizes, to false positive effects (Ioannidis, 2005; Simmons et al., 2011). A combination of low statistical power, and a bias toward publishing novel and exciting findings, has led to a crisis: many findings do not replicate. For example, assuming a powerful posture does not increase testosterone or influence your behaviour (Ranehill et al., 2015). Playing classical music to your child probably doesn't make them smarter (Chabris, 1999). And will-power is not a finite pool of resources that can be depleted (Hagger et al., 2016). As a reaction to this "replication crisis" new open science practices – that aim to make science open, accessible, and reproducible – have started to gain traction.

Open science practices can be broken down into two major categories: procedural and analytical. Procedural open science practices include locking in your methods, hypotheses, and planned analyses prior to data collection. These plans can be preregistered on an online platform like Open Science Framework (OSF; https://osf.io) or can be submitted to a journal as a registered report which can be accepted by a journal in principal, regardless of the eventual findings. These practices reduce barriers to the publication of null findings across the literature and prevent researchers from – inadvertently or otherwise – changing their hypotheses to fit their data. Analytical open science practices include sharing data and analysis code, and using open source software and tools, that aim to increase reproducibility and the ability to error check previous studies. While these changes in data generation, analysis, and publication impact psychology as a whole, young researchers face the challenge of implementing these practices in a context in which the practices are still developing, and there can be some resistance to adoption. In the current article we highlight perspectives of three New Zealand graduate student reflecting on how open science influences their work and the wider scientific community.

student reflections on open science

Sam Twitchin is a MSc student in cross-cultural psychology at Victoria University of Wellington, supervised by Rita McNamara. His work focuses on the effects of religion on cooperative behaviour. His masters research investigates how cooperative behaviour might be influenced by religious belief and feelings of belongingness with religious groups.

Samuel Twitchin
Masters Student, Centre for Applied Cross-Cultural Research

What is your project and how does open science fit in?

My research focuses on whether levels of cooperative behaviour change after participants are primed with reminders of religious belief. I have begun the process of preregistering this project and have found the process to be not just good for open science, but also beneficial for developing my understanding of how to undergo a scientific project. This is especially relevant for someone such as myself, navigating unfamiliar territory at the beginning of my research career. Preregistration provides a structured way of understanding and stating exactly what I am doing in a clear and methodical way. Additionally, the process is not rigid and allows for any changes that may naturally occur after preregistering the study to be noted and logged in the final write up, which means that the entire process is transparent and malleable. This provides both security in what I, as a young researcher am doing, and also in being

comfortable with any potential changes that may occur due to unforeseen circumstances.

How is open science influencing your wider field?

Cross-cultural psychology developed as a field in response to the trend of the difficulty to replicate Western psychological findings in non-Western contexts (e.g., Heine, Norenzayan, 2010; Serpell, 1979). These difficulties often derive from problems with method bias, such as using the same tools for two different cultures, when these tools are familiar to one but not the other cultural group (Serpell, 1979). Other problems include translation issues, experimenter bias, and questions of the validity of measurement across cultures. Problems such as these emphasise the importance of open science for assessing psychological phenomena across cultures. Open science practices allow cross-cultural researchers to share their knowledge more efficiently, by sharing standardised translations of measures, pre-emptively addressing problems of equivalence or bias, and providing transparency for how cross-cultural comparisons were conducted.

Kealagh Robinson
PhD Student, Youth Wellbeing Study and the Cognitive and Affective Neuroscience Lab

What is your project and how does open science fit in?

My PhD research focuses on understanding how young people who engage in non-suicidal self-injury generate, interpret, and remember their emotional responses. As many other researchers who work with unique populations will know, recruiting and conducting research with a unique sample requires additional time and resources. These constraints often result in small sample sizes and mean that the literature is full of concerns regarding low statistical power. Open science practices address these challenges in two key ways. First, open datasets and open code have allowed me to run pilot analyses to better refine my methodology and statistical analyses before I have invested time and resources. Second, preregistration of my research protocol, sample sizes, and data analyses has made me double, triple-check my work and this transparency results in more confidence in the scientific value of my findings and conclusions.

How is open science influencing your wider field?

Although clinical psychology has been slow to enter the

open science conversation (Tackett, Brandes, Reardon, 2019), recent work has begun to identify weak spots (Dwan, Gamble, Williamson, & Kirkham, 2013), establish best practice guidelines (Tackett, Brandes, King, & Markon, 2018), as well as bringing together clinical open scientists (to join, visit https://goo.gl/forms/tvAijds0as7peCdG2). As a field, investing in open science practices is critical to improve the credibility of clinical science and ultimately generate a stronger evidence-base for clinical practice.

More broadly, open science also encourages researchers to reflect on the principle of public open and transparent access to research. Although key stakeholders in the field of adolescent mental health, school mental health professionals are often excluded from traditional academic research by paywalls and by virtue of schools being very busy places. health professionals with open access academic publications (e.g., through preprint servers like PsychArXiv or open access journals). These however are 'open' in principle (i.e. available and free), but not open in practice (i.e. adhering to the principles already discussed in this article in relation to open science research). One way that my research group is trying to address this challenge is by hosting a free annual workshop where we share our research with school mental health professionals and youth workers (find out more at https://youthwellbeingstudy.wordpress.com/).

Amy Walsh
PhD Student, Cognitive and Affective Neuroscience Lab

What is your project and how does open science fit in?

Emotional distractions are difficult to ignore (Yiend, 2010). My PhD research focussed on whether motivation can help us to control our attention to filter out emotional distractions. I conducted a study – that won an open science framework preregistration challenge prize – in which participants completed a simple visual task while attempting to ignore emotional and neutral images. Throughout the task I measured pupil size as an index of mental effort and emotional processing. To elicit motivation, half the participants received money as a reward for fast and accurate performance; the other half did not. Participants were more distracted by emotional than neutral content, but preregistered analyses showed that reward reduced emotional distraction. Additionally, exploratory analyses of pupil size were consistent with motivation eliciting control of attention in anticipation of distraction. One criticism of preregistration is that it does not allow for such exploratory analyses, and so important findings may be missed. But this is not true. Preregistration makes the distinction between planned and exploratory analyses transparent, removing the temptation to "hypothesise after results are known" – one of the key causes of the replication crisis in psychology. Open materials, data and code: osf.io/yhkdr/. Free link to the paper preprint: psyarxiv.com/k4z6u/

How is open science influencing your wider field?

When Daryl Bem, a respected psychologist, published a study that claimed to show that precognition (i.e., recalling the future) was possible, social and cognitive psychologists were perplexed. This research followed common practices in the field, the effect was replicated multiple times in separate experiments, he tested over 1000 participants, and the paper was published in a top-tier journal (Bem, 2011). Either precognition was real, or there was something wrong with our accepted practices (Wagenmakers et al., 2011). The first issue was the presentation of exploratory findings as confirmatory or creating a post-hoc narrative to fit the data. If you search hard enough in a data set, you will find a statistically significant effect. But if that finding is not predicted by theory, then it may not be meaningful. The second issue was the file-drawer problem; we do not know how many times Bem failed to find evidence for precognition and did not publish those data. The third – and more insidious – problem is the "garden of forking paths" (Gelman & Loken, 2013). Unless we preregister our analysis plan, we make many decisions that are influenced by what we see in the data. For example, deciding on outlier and exclusion criteria; combining or separating dependent variables; choosing a time-window of time-series data to analyse; and so on. The move in our field towards preregistration and transparency controls for these issues, to produce reliable and valid findings that we can trust.

Synthesis

Students at different levels of study embrace open science practices, adopting elements that help them to conduct sound and reproducible research. The benefits of open science practices are not only restricted to the research process, but also have implications for the wider community by making the findings of research accessible on preprint servers and materials available for studies to be reproduced.

Getting started as an open scientist

Below we provide a range of resources to get started learning about Open Science. Also see our reference list for recommended readings (marked by **).

Join the Australia and New Zealand

Open Research Network (ANZORN):
- OSF page: https://osf.io/be7yt/wiki/home/
- Website: https://anzorn.netlify.com/

Get on twitter. Follow us:
Johannes Karl: @J_A_Karl
Kealagh Robinson @KealaghRobinson
Sam Twitchin: @TwitchinSamuel
Amy Walsh: @walsh_aims

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Alex Holcombe: @ceptional (AU)
Daniël Lakens: @lakens (NL)
Emily Kothe: @emilyandthelime (AU)
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Matt Williams: @matthewmatix (NZ)
Michael Philipp: @mikephilipp (NZ)
Rita McNamara: @GuessRita (NZ)
Jennifer Tackett: @JnfrLTackett (US)
Sanjay Srivastava: @hardsci (US)
Simine Vazire: @siminevazire (US)

Listen to podcasts about doing good science:
The Black Goat: http://www.theblackgoatpodcast.com/
(start with Episode 11 & 19)
Everything Hertz: https://soundcloud.com/everything-hertz
(start with Episodes 35 & 69)

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** Recommended readings

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Rochelle Nafatali, the NZPsS student rep on the Executive

Tēnā koutou e te whānau, ko Rochelle Nafatali ahau. I was born in Tāmaki Makaurau, grew up in Tai Tokerau, spent 14 years in Pōneke, and am Kiwi Samoan. After completing my master's at Victoria University (in forensic psychology), I relocated to Auckland and am now in the Massey DClinPsych programme.
I am the new student representative on the NZPsS Executive. If you have any issues you would like me to raise on your behalf please make contact with me at rochelle.nafatali@gmail.com