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Margaret K. Merga
Edith Cowan University

Shannon Mason

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Mentor and peer support for early career researchers sharing research with academia and beyond

Margaret K. Merga [a,*], Shannon Mason [b,c]

[a] School of Education, Edith Cowan University, Perth, Australia
[b] Faculty of Education, Nagasaki University, Nagasaki, Japan
[c] School of Education, Murdoch University, Perth, Australia

ABSTRACT

There is a growing expectation that doctoral candidates and early career academics publish research outputs such as journal articles and conference papers, and that they share their findings with key stakeholders beyond academia. However, it is not known if these expectations are being coupled with support from mentors and peers within institutions. Through interviews with recent PhD graduates working as early career researchers in Australia and Japan, this paper investigates if mentor and peer support for producing both academic and translational outputs was forthcoming during their doctoral candidature and beyond. It also investigates kinds of supports provided in doctoral candidature and early career. Thirty early career researchers in Australia and Japan took part in this qualitative study involving in-depth semi-structured interviews with a purposive sample of respondents. Researchers made translation support available for Japanese respondents so that those with limited English could take part. Findings suggest that mentor and peer support were not universal, and some respondents did not have a mentor or significant peer influence supporting their production of academic or translational research outputs. Support for sharing research with audiences beyond academia could be limited, with production of outputs for academic audiences consistently a greater focus of support. There were no mentoring supports for translational outputs that had salience across Australia and Japan within the sample. While limited attention has been given to the role that peer influence may play in supporting research output production of early career researchers the more even power relationship between peers as opposed to the peer-/mentor dyad can allow unique supports to flourish. Where institutions expect growing and diverse research output production by doctoral candidates and early career researchers, they should also ensure that support is provided through facilitating mentoring and peer relationships.

1. Introduction

Professional and personal advantages are conferred to individuals, their supervisors and their institutions when doctoral candidates (DCs) publish (Kwan, 2010; Merga and Mason, 2020a), and there are ongoing benefits for early career researchers (ECRs) who communicate their research (Bartkowski et al., 2015). The PhD journey is a research apprenticeship during which valuable skills for research communication can be acquired, aligning with growing expectations that DCs share their research with their peers through the production of scholarly research outputs. For academics early in their career, and even earlier during doctoral candidature, research communication can be a challenging skill set to learn, with these fledgling researchers expected to potentially master production of a range of research texts in order to share their research with diverse research audiences. We argue that these fledgling researchers require mentorship, as they are often developing these complex skills in challenging and competitive environments without the protective consolation of permanent employment, while also often feeling a heightened sense of personal vulnerability (Hutchins, 2015). They may also feel pressure to publish which combined with their inexperience can lead to their exploitation by predatory journals (Vuong et al., 2020). Fledgling researchers are particularly vulnerable to barriers in meeting research output benchmarks within academia, whether they relate to individual, societal, institutional, or broader higher education policy factors.

Research exploring mentoring of DCs and ECRs has investigated how mentoring may support timely completion and discourage attrition in DCs (Geesa et al., 2018), and ongoing mentoring support is needed to ease the transition of ECRs into academia beyond doctoral candidature (Hollywood et al., 2020). Attention has also been given to how to match mentors and mentees to optimize conducive working relationships (Hass, Hall & Vlasnik, 2018). However, we explore if DCs and ECRs have sufficient support from their mentors and peers to produce research outputs for academic audiences.

In addition, due to the growing emphasis on sharing research beyond academia, with stakeholders in industry and governance as well as the general public, broader dissemination is increasingly a prerogative of DCs and ECRs. These outputs for end-users beyond academia that communicate findings using an accessible voice and for the consumption of non-academic target audiences can be termed *translational outputs*. Little is known about how mentor and peer influences may support the production of diverse research outputs, and the kinds of forms this support may take.

To this end, our paper focusses on the following research questions:

1. Do DCs and ECRs typically have mentor and peer support for producing academic and translational outputs?
2. Where mentor and peer support was provided, what interpersonal supports did ECRs receive to produce academic and translational research outputs as ECRs and DCs?

We draw our sample from both Australia and Japan to generate findings that hold some cross national and cultural salience within the limitations of the sample to form a foundation for further international research to test the generalizability of the findings we report herein. To this end, the research questions considered here were not designed to be comparative, juxtaposing norms in nations or disciplines, focusing primarily on commonalities. We see this project as the first phase in an ongoing research plan that adopts a fixed approach to mixed-methods aligning with an exploratory sequential design, with this Phase One interview data collection informing the development of a Phase Two survey approach (Creswell and Plano Clark, 2011).

1.1. Nomenclature

There is considerable variation across nations in conceptualization of DCs and ECRs. For example, in Australia, a doctoral candidate is enrolled in a doctoral program, and while they are still in the relatively early stages of the degree, they have had their project approved and institutional ethics approvals granted through confirmation of candidature. Unlike the United States (US), Australian doctorates do not typically entail coursework, though there are some exceptions (e.g. Edith Cowan University, n.d.). The UK Quality Assurance Agency for Higher Education (2011) uses DC as a synonym for doctoral student, noting that "this is the most suitable term to use, even though in some institutions a distinction is made between 'student' and 'candidate' depending on whether the individual has successfully completed some kind of transfer of status stage "(p. 1). For the purposes of this paper, we use this broader definition of a DC as an individual enrolled and undertaking a PhD program, though we recognize that there are considerable differences in how DC status is typically attributed.

Conceptualization and nomenclature of ECRs is also widely varying, with post-doctoral time frames such as 10 years (e.g. National Academies of Sciences, Engineering and Medicine, 2019), eight years (e.g. Arts and Humanities Research Council, 2020) and three years (Elsevier, 2020). Definition of ECR status can vary greatly in response to the purpose of the designation, as well as both within and between nations, and while it is typically related to date of doctoral conferral or viva delivery, this is not always the case. The Japan Society for the Promotion of Science (2019) deems an ECR as "a researcher who is who is less than 8 years after PhD acquisition" (p. 3). We draw our definition of an ECR from the Australian

Research Council (ARC), which views them as academic researchers within 5 years post-PhD conferral (ARC, 2018), with some scope for an extension of this period where significant life factors (e.g. illness, maternity leave) have limited the researchers' capacity to conduct research within this period.

1.2. Research communication for academic audiences

Research needs to be communicated both within and beyond academia to have positive real-world impact, and research communication is essential for DCs and ECRs. These fledgling researchers must produce high quality research and ensure that it reaches an interested audience both in academia and beyond in order to progress in academia and secure ongoing employment. ECRs need to publish in high-impact journals to sustain academic employment (Nicholas et al., 2017). Those completing a PhD while employed in academia may be particularly likely to publish or attempt to publish during doctoral candidature, producing a Thesis by Publication (TBP) (Mason and Merga, 2018; Mason et al., 2020), perhaps motivated by the growing value attributed to academic publication in institutional values and rankings, and individuals' post-doctoral employment prospects (Guerin 2016; Merga et al., 2019; O'Keefe, 2020). Publishing during doctoral candidature has been linked to numerous other benefits such as facilitating broad dissemination of findings (Kamler, 2008; Robins and Kanowski, 2008), as well as obtaining useful critical feedback from reviewers and building research and writing skills (Dowling et al., 2012; Guerin, 2016; Merga et al., 2019), and all of these benefits also hold ongoing currency for ECRs.

DCs may not receive adequate support to produce academic research outputs, and therefore not all ECRs enter their academic role post-PhD with experience in negotiating the academic publishing process (Merga et al. 2018). Preparedness of ECRs to produce quality research outputs cannot be assumed, with many doctoral programs inadequately preparing candidates to meet the need for research output production in early career (e.g. Badenhorst and Xu, 2016; Kwan 2010). While academic research outputs are highly valued and expected, adequate support to create and share these outputs may not always be readily accessible to ECRs. This is despite the valuable contribution that ECRs' individual research outputs make to the ranking of their respective universities.

1.3. Research communication for non-academic audiences

It is no longer sufficient for DCs and ECRs to be solely focused on communicating their research within academia. ECRs may be required to demonstrate research impact in industry, governance and/or society as a requirement of their role (Schnitzler et al., 2016). This is partly due to declines in public funding, with universities increasingly competing for diverse external funding from industry and government sources (Lee, 2002). In recent times, discussions about the role of universities have increased pressure for these institutions to demonstrate broader relevance beyond academia, and be held to greater accountability (Cain et al., 2018). Research needs to be communicated beyond academia to have positive real-world impact and demonstrate this relevance. Sharing research findings beyond academia is increasingly both valued and expected in humanities and social sciences (HASS) and science, technology, engineering and mathematics (STEM) disciplines (Grimshaw et al., 2012).

Fledgling researchers are increasingly expected to create research outputs that can reach audiences beyond academia and generate research impact by finding utility in industry, governance, professional and public spheres (Chikoore et al., 2016) in order to generate evidence-based policies and practices (Cooper et al., 2009). Research needs to be communicated using a diverse array of text types (Carpentier, 2020). This is necessary because "most people, including most professionals, get their knowledge of research not from reading the original studies, but through various mediating processes", such as, but not limited to "professional development events, the work and publications of professional

associations, materials provided by lobby groups of various kinds, the transmission of research through people's places of employment and, significantly, the mass and trade media" (Cooper et al., 2009, p. 162).

1.4. Pitfalls and preparedness

It cannot be taken for granted that fledgling researchers will be able to negotiate these complex environments and produce research-informed texts that will appeal to diverse audiences. Research suggests that some ECRs may lack confidence in their skills to communicate in this capacity and see building their skills in this area as a work in progress (Merga and Mason, 2020b). For information from translational sources to lead to knowledge acquisition by the intended audience(s), they must find the message accessible and engaging (e.g. Haßler et al., 2019). While engagement with end-users beyond academia is increasingly easy through outlets such as social media use (Sugimoto et al., 2017), such engagement offers unique challenges which fledgling researchers may need support to navigate (Haber et al., 2018). Strong communication skills are essential, as engaging with end-users outside academia directly or through the media can be a complex and contentious process, with language, voice, selection of detail, inference and emphasis all closely involved and implicated in the accurate dissemination of findings. As the skills needed to communicate with diverse audiences may be considerable, institutions need to support the development of research dissemination skills beginning at doctoral candidature. However, communicative outputs may be poorly supported and rewarded by academic institutions (Sá et al., 2011).

1.5. Research translation or knowledge mobilization?

Communication of research knowledge beyond the scholarly community may be termed knowledge dissemination, implementation or translation (DeForge et al., 2019). Herein we refer to these outputs as *translational outputs*. We also note that where the knowledge exchange is not uni-directional research translation from academic to end-user recipient, this is known as knowledge mobilization (KM), a process which highlights "the interactive, social and gradual nature of the connection between research and practice and makes it clear that this is not a one-way process" (Levin, 2013, p. 2). Cooper et al. (2009) also prefer this term as it aligns with the assumption that knowledge use is "a social process, not just an intellectual task", that it is "multidirectional, not just a matter of moving information from those that know to those that do not", that it is purposeful and strategically directed, "not just random interaction", and that it may entail multiple phases and be responsive to unique audiences and contexts as applicable (pp. 166–167). As universities increasingly support KM as a research priority, we anticipate that across disciplines (and not just in STEM), it may become increasingly common for engagement with entities beyond academia to be established early in research projects.

1.6. Interpersonal support for sharing research

At the interpersonal level, ECRs may seek mentors and influential peers to support their production of independent research and related outputs (Hemmings et al., 2013). While mentoring is conceptualized in diverse ways, Turban and Lee (2008) describe it as "an intense interpersonal exchange between a senior, experienced, and knowledgeable employee (i.e. the mentor) who provides advice, counsel, feedback, and support related to career and personal development for a less experienced employee" (p. 21). Mentoring relationships can emerge informally or be part of a formal program wherein mentor and mentee enroll to participate (Schriever and Grainger, 2019). Mentoring can have a positive impact on support ECRs grapple with diverse challenges that they may encounter in their new profession. For example, in a research-intensive university in China, the support provided by experienced colleagues was found to be essential to overcoming some of the considerable hurdles

faced in disseminating research in a second language (Jiang et al., 2017). While there is limited research on DC and ECR mentoring that specifically focusses on mentors' support for their production of research outputs beyond the thesis, mentors can play an important role in supporting students to meet required levels of communicative competence to share their findings (Roberts et al., 2019). In addition to direct influences such as formal or informal mentoring, interpersonal influences of influential peers could shape attitudes and practices, potentially of both mentors and mentees (Booth et al., 2016), though this avenue of influence has received less attention than dyadic supervisory mentoring in the extant literature on ECR production of research outputs. Where the role of influential peers or academic friends has been considered in relation to research communications, this has been generally confined to the writing up of the thesis. For instance, Jairam and Kahl (2012) noted that "academic friends provide advice about time and stress management, and they provide assistance with writing, research, and teaching issues. Participants indicated that support in writing and research was instrumental in assisting them in the composition of their dissertation" (p. 318). The extant research does support the differentiation of mentor and peer influences within the interpersonal support strata (Ponjuan et al., 2011), highlighting the importance that these two different collegial relationships, with different degrees of power balance, not be conflated.

1.7. A social ecological model of institutional support

A social ecological model is used as an informing theoretical frame for this work, as it takes into account diverse influences from personal and environmental factors that can influence an individual's behaviours and experiences (United Nations Children's Fund (UNICEF), 2013). As seen in Figure 1, the model when adapted to address institutional support for production of research outputs for diverse audiences assumes that supports at individual, interpersonal, community and organisational levels can influence ECRs' experiences and successes in producing these outputs. By looking at how influences from different institutional strata may support this work, the model assumes that institutional support may be holistic and multi-faceted in its orientation, and findings can yield implications to enhance support at specific levels. As such, this model highlights the complexity and contextual reality of the experience of institutional support (Lounsbury and Mitchell, 2009). The research reported in this paper focusses on the interpersonal level.

Identifying institutional factors that enable and constrain ECRs' output production will provide essential foundational work for universities seeking to improve the quantity and quality of ECR research contribution and communication. Our previous paper (see Merga and Mason, 2020d) explores the organizational and community supports represented in Figure 1, finding that "sharing research for academic and other diverse audiences is often perceived as valued but may not always be supported". While this previous paper focusses solely on the upper two
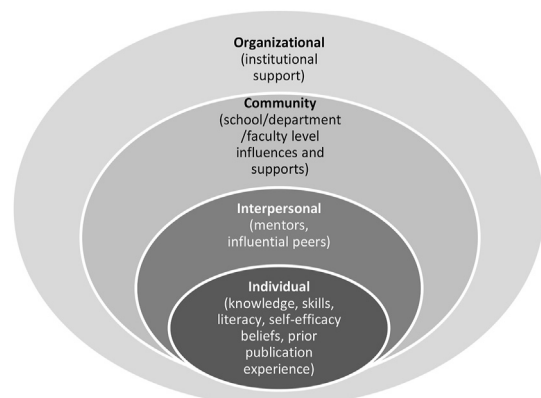

Figure 1. Social ecological model adapted from UNICEF (2013).

components of the model (organisational and community strata) this paper is purely concerned with unpublished data related to the interpersonal strata, to explore the consistency and kinds of supports available at this level.

2. Methods

2.1. Australia and Japan

The study conducted in-depth, semi-structured interviews with ECRs in Australia and Japan, investigating their experiences of creating and communicating research outputs designed for both academic and non-academic end-users as DCs and as ECRs. The in-depth semi-structured interview approach was used as a deep exploratory approach was needed to provide insights into the research questions, particularly as very little previous research has explored ECRs' support for producing research outputs for audiences beyond academia. The sample was drawn from Australia and Japan for a number of reasons. First, as previously highlighted, while the method we employ herein precludes statistical-probabilistic generalizability (Smith, 2018), we sought to generate findings with cross national and cultural salience to constitute a foundation for further international research to test their generalizability. Therefore, a sample derived from varied contexts was fit for our purpose in terms of diversity of linguistic and cultural orientation, as well as other contextual factors, such as Japan's self-contained academic system characterized by relatively limited mobility of academics, and there is relatively little movement of Japanese academics internationally (Yonezawa et al., 2016). It has also been contended that ECRs in Japan experience academic inbreeding, as universities typically recruit their own graduates as faculty after completion of the doctorate (Horta et al., 2011). While qualitative studies of ECR experiences have been conducted across two nations in the past (e.g. Hemmings, Hill & Sharp's (2013) study of 10 ECRs across Australia and the United Kingdom), there has been no study of comparable purpose to ours that includes perspectives from both Australian and Japanese contexts. The sample was also convenient to the researchers as the authors work at Australian and Japanese institutions, though much of the data collection for the Japanese sample was undertaken by both researchers, with Merga asking the interview questions and Mason providing in situ language translation and support if needed. Our sampling approach also facilitates the promotion of voices and experiences of Japanese academics which hold a marginal position in higher education research particularly compared with dominant perspectives of Anglo-American academics (e.g. Arnett, 2016; Faraldo-Cabana and Lamela, 2019), and therefore providing translation and language support in our research was particularly important to us, as we did not want low English language proficiency to act as a barrier to participation. We also note that as Australia, doctoral degree programs in Japan vary greatly between institutions and disciplines. However, guidelines from the Ministry of Education, Culture, Sports, Science and Technology (2009) state that there are two main pathways to gaining a doctorate locally. The first is to enter an approved doctoral program after completing a (usually) two-year Master's degree, in which case the doctoral program will run for approximately three years. For students who enter without a postgraduate qualification, the norm is to enter a five-year program, the first two years of which is dedicated to coursework.

2.2. Participants and sampling

Findings are drawn from responses from 30 ECRs based in Australia and Japan. In addition to the sampling considerations around nations we have raised previously, individuals in the sample were selected and recruited based on a purposeful sampling approach (Patton, 1990). Specifically, "we used a purposeful sampling approach to ensure high variation within the sample within the resourcing constraints of the Project", and this included "respondents from a broad range of disciplines

and backgrounds" (Merga and Mason, 2020c, p. 3) as seen in Table 1 below.

We adhered to the aforementioned ARC (2018) definition of an ECR as less than five years post-PhD conferral, with only one respondent slightly exceeding these parameters by less than one year. This also meant that respondents had realistic recall of their experiences both as DCs and ECRs as the time lapse between PhD completion and the interview was typically less than five years.

All respondents were employed at universities in positions that required them to produce research outputs, and respondents were strategically sourced from an array of cultural and linguistic backgrounds, as per Table 1. As also seen in Table 1, there were more male than female participants, with sampling in the Japanese population constrained through comparatively low levels of female participation in academia (see Taka et al., 2016), and more Australian than Japanese respondents. Most respondents were in their 30s or 40s at the time of participation as per Table 1. An equal number of respondents were recruited from HASS and STEM research areas. Respondents were from across ten universities in total: four universities in Australia and six universities in Japan.

Data are presented with close consideration given to preventing deductive disclosure of participants (Kaiser, 2009). This was particularly pertinent in light of the relative vulnerability of the ECR population, and the potentially critical stance some respondents may take towards support received by mentors and peers within their academic communities. All respondents had published at least one peer-reviewed journal article at the time of the interview, although this ranged from one to 43 articles, reflecting earlier findings of diversity among ECRs' publication outputs (for example, Laurance et al., 2013). The paper is constrained by the limitations of self-report inherent in this method. It is a further limitation that we do not quantise the qualitative data to preclude insinuation of generalizability. We note that while all findings meet salience criteria (as we outline further herein) and therefore were not unique to a single respondent or context, further quantitative research is needed for statistical-probabilistic generalizability to be asserted. This future research could also separate the analyses between HASS and STEM for the purposes of focusing on differences between these fields, which was not the aim of this research. It could also take a more comparative position between nations rather than focusing on cross-contextual commonalities.

2.3. Procedures

Data collection occurred after institutional ethics approvals were granted from Edith Cowan University's Human Research Ethics Committee, and all participants provided informed consent prior to participation in the study, with access to information documents in both English and Japanese. All interviews were conducted between July 15 and September 23, 2019, at venues nominated by respondents. Interviews typically conducted in situ by at least one of the two lead researchers. Interviews ran for approximately one hour. While some English was used in all interviews, as aforementioned, Japanese/English translation was provided by one of the research team where respondents lacked confidence in their English language skills. This optimized interviewee comfort and facilitated the inclusion of the comparatively marginalized voices of non-proficient English speakers.

In addition, our respondents chose their own pseudonyms so that they could have the opportunity to find their voices in subsequent publications of the data. We feel that this approach also raises the accountability of the research team, requiring them to carefully present and interpret the data provided by the participants, as these participants will readily be able to scrutinize the accuracy of representation of their unique contribution. This also meant that pseudonyms did not necessarily correspond with traditional names at the country of origin. For the purposes of the study, a mentor was conceptualized as a more experience individual who provided advice or support, often but not always a supervisor. A peer was

conceptualized as an individual at a relatively similar stage of their career, with whom the mentor/mentee power imbalance did not exist.

2.4. Measures

The interview questions were designed to explore the aforementioned research questions encompassing previous experiences as a DC and current experiences as an ECR. The interview questions we report on were as follows:

1. Do you have mentors who have previously or continue to support your production of research outputs:
   a) for academic audiences? If yes, how do they/have they supported you?
   b) for non-academic end-users? If yes, how do they/have they supported you?
2. Do you have influential peers who have influenced your production of research outputs:
   a) for academic audiences? If yes, how do they/have they influenced you?
   b) For non-academic end-users? If yes, how do they/have they influenced you?

2.5. Analysis

In order to address the research questions, we applied a conventional content analysis approach, as existing research literature on the kinds of support investigated is developing rather than established (Hsieh and Shannon, 2005). We applied salience criteria. Our qualitative analysis approach around the kinds of support provided through different strata identified themes that needed to be recurring (addressed by more than one respondent) and occurring across both national contexts in order to be deemed salient, with an inductive approach employed (Kondracki

Table 1. Respondent characteristics.

Characteristic	in sample (n = 30)
Gender	
Female	13
Male	17
Other	0
Country of residence	
Australia	17
Japan	13
Disciplinary area	
STEM	15
HASS	15
Age group	
20s	3
30s	18
40s	8
50s	1
Year of PhD conferral	
2019	3
2018	7
2017	4
2016	9
2015	6
2014	1
English as additional language/dialect (EALD)	
Yes	19
No	11

(adapted from Merga and Mason, 2020c).

et al., 2002). We chose to focus this paper on findings that had relevance to both contexts.

Thematic coding was performed by the first author and checked by the second author, and NVivo was used to support the analysis. An iterative thematic coding approach was employed using a constant comparative method (Boeije, 2002; Kolb, 2012). Quotes are presented either in verbatim or in edited verbatim form, with meaning carefully preserved, and the results and discussion are presented together as acceptable in the qualitative approach. Where the quote is of a translation, this translation occurred in-situ during the interview by researcher Mason. Quotes based on translations are distinguished when used. Interviewees were offered the opportunity to review the transcripts and redact or add content prior to analysis. Two respondents (one Australia based, one Japan based) availed themselves of this opportunity.

3. Results and discussion

3.1. Mentor and peer support not universal

Findings suggest that mentor and peer support are not universal, and some respondents did not have a mentor or significant peer influence supporting their production of academic or translational research outputs, and this occurred across contexts and cultures. For instance, Tara viewed herself a "lone ranger". Similarly, Vince observed that

I've never had a real proper mentoring relationship like a patron or anything like that. It was very much blindly groping until I figured out the way forward. A lot of trial and error. And I was fortunate enough that I didn't have any really major setbacks in that while I was doing that. I think if I'd gotten sick or I'd had some kind of family responsibility or something that came up…I did get divorced but, apart from that, I think I've been quite fortunate in having a kind of space to figure it out and I think a lot of people don't.

I've seen a lot of people kind of go underwater in that kind of phase where they're trying to figure out how do I actually do this and not really having the person there to go, "All right, this is what you need to do, this is what you don't need to do, here's some funding that I've got for you, here's a project that I want you to work on to train you up on this particular skill set that will help you off down the line." I never really had that. Most of my colleagues that I went through the process with didn't have that either.

Vince recognized that he was fortunate to have avoided going "underwater" due to additional personal pressures that would have been compounded by the lack of mentoring support, though being without a mentor was viewed as placing him in a position of greater vulnerability. Within his collegial group, receiving mentoring was not a norm.

In some instances, there was a mentor appointed, but workload limited the relationship, with Ken explaining that in his Japanese context, "so, I have a mentor, but I have no time and the mentor doesn't have time", and as the most inexperienced member in his community, he described not having supportive peer relationships with colleagues at a similar juncture in their career. This is reflective of research that suggests that while unstructured mentoring relationships can flourish, they may also fail as "the lack of a formal structure may result in the abandonment of the mentoring relationship" (Schriever and Grainger, 2019, p. 729).

It is noteworthy that lack of a mentor was not always described in negative terms, considering the emphasis on the importance of mentoring for ECRs, and some previous work has also yielded ambivalent or negative views toward mentoring in ECRs (e.g. Sutherland-Smith et al., 2011). In our study, Kenji, who did not have a mentor, noted that "I have never experienced a need for any mentor, yeah, in general", and attributed this lack of need to the strong peer supports he had around him. Similarly, Merga (2015) attributed early publication success without a mentoring supervisor to strong institutional support from her university, explaining that as a doctoral candidate she "was able to attend a number of workshops" that focused on "academic writing on campus, as well as

access all of the additional support I needed to become confident in the numerous skill deficiencies that I identified as barriers to my project achievement (p. 298)".

3.2. Emphasis on academic and translational outputs

The focus of valuing and support for production of both academic and translational research outputs varied, and for purposes of generalizability, further quantitative research beyond this sample is indicated. Mentoring and peer support of translational outputs could be limited, with academic outputs consistently privileged. This was attributed in some instances to the relative newness of this competing priority. Australian respondent Calvin found himself a trailblazer in this regard, noting that "at the risk of sounding arrogant, I'm one of the more pro-active people in my department about engaging with media". As a trailblazer, he could not rely on advice or support from more experienced peers. Some communities and universities were described as being in a transitional state; while Mary could not list any mentoring support given for production of translational outputs, she noted that it was likely that such focus would grow as her institution moved to increasingly value a broadening definition of research impact. Therefore, there was in some cases a degree of optimism that while support was not yet forthcoming, as universities shifted their support to be responsive to internal and external priorities, level of support was expected to increase.

3.3. Mentor support for academic outputs

While there was some mentor support for the production of academic outputs, there were no mentoring supports for translational outputs that had salience across contexts, and the level of mentoring support for translational outputs was very low within the sample. Feedback, co-authoring and researching, encouragement and writing were all salient themes that emerged as mentor support as discussed herein.

3.3.1. Feedback

Feedback from mentors was a salient support mechanism in the sample. For example, Japanese respondent Masa explained that "in the seminars, supervisors say something helpful, and (give) advice, but mainly (support) the wording and terminology, and the presentation skills". Also Japan-based, Andy explained that "in my decisions, I have one mentor" who provides significant support though technical and non-technical advice, leading him to comment that therefore, "I could say that I received full support from the university in order for me to make good research and publications". In Australia, Demelza described receiving comprehensive support and feedback.

Just everything from talking about the ideas, giving me feedback on ideas and the design of the experiment and checking, like before I start data collection that, you know, everything's good and then discussing the results and writing the paper and discussing …so lots of feedback. So, I haven't written up anything I've done with him that's new yet because it's still kind of happening. But those manuscripts, he will definitely be reading closely and it's hard to get anything past him, he's a perfectionist, so that might be an issue because it slows things down. But then you do get a really good paper at the end.

For Demelza, this feedback slowed the process of producing academic outputs, but the reward was higher quality work, perhaps more likely to pass expeditiously through peer review. Feedback was requested around an array of facets relevant to the production of academic research outputs, with feedback potentially given at multiple points during the creation of academic outputs.

3.3.2. Co-authoring and researching

Mentors also could contribute to the research journey of ECRs through co-authoring and co-researching, reflective of previous research (e.g. Schriever and Grainger, 2019). While as noted by Lotrecchiano et al. (2016), "few studies have reported apprenticeship or formal training opportunities as primary reasons why researchers would be motivated to collaborate", learning from collaboration was typically highly valued. For instance, Calvin explained that

thankfully for me, which was a lifesaver, is that I ended up getting a working relationship going with, funnily enough, a person from [another university] in a different discipline weirdly enough… And we still work together, which is awesome. We're still working on research together still. We've had a working relationship for the last five or six years almost, it's wonderful. Yeah, she was great. She helped me to get some runs on the board via collaborating with me on some stuff and I learnt a lot through all that process. Basically, she served the purpose for me of what my PhD supervisor should have been in terms of helping me to get some papers on the boards and stuff.

As described by Calvin, while the ECR co-authoring mentor was often the former PhD supervisor, this was not always the case, and the mentor did not necessarily even need to be from the same institution or discipline. The quality of the support received, and the relationship could take primacy over a common disciplinary knowledge base. This collaborative approach supported Calvin to achieve academic publications, and it also provides a concrete example of where a perceived support gap in the doctoral journey (disengaged supervision) has been filled by another party, a mentor.

3.3.3. Encouragement

Encouragement from mentors could be highly valued, and this kind of nurturance can be a key supporting strategy in the mentoring relationship (e.g. Clarke, 2004). Australia-based respondent Callie described the encouragement she received from her mentor.

From the technical side of things, one of my PhD advisors, the research that I do now aligns very strongly with his expertise and he is constantly door open policy and he gets so excited about stuff. I'll go to him and I'll be like, "Hey, I found this out."

And he's like, "Oh my God, can you show me it sometime? Can we figure out a meeting time?" And he's so passionate and excited about it and that's really great. When I hear of other people's stories around PhD supervision or just … even not necessarily peers but people who are above them, with experience levels much higher that kind of (say), 'I don't have time for this'. But I have not experienced that. And I feel very fortunate that that is the case.

Callie acknowledged that this level of encouraging support was not necessarily a norm in academia, observing that experienced academics do not always find time to encourage fledgling ECRs.

3.3.4. Writing

Crucial for the production of academic research outputs, academic writing skills were fostered by mentors, which is essential as "publications are an even more significant marker of distinction and competence than ever before" (Bartkowski et al., 2015, p. 99). Though he had achieved strong writing skills during his doctoral candidature, as an ECR,

Henry still appreciated ongoing support from his generous mentor, who read his written work before submission.

> *Even now things that I don't necessarily need his help on I'll always ask him to look over before I send it off, and I probably shouldn't do that now. I should be fending for myself, but he's happy to do so.*

Mentors also provided support in editing work and providing advice on the publication journey.

3.4. Peer influence on academic outputs

The different focus of peer influence on academic outputs compared with mentor influence highlights the importance of discrete research on peer influence that is not subsumed into mentorship. Motivation, inspiration and competition; ideas and advice; writing, benchmarking and models; and, friendship and emotional support emerged as salient themes that provide insights into how peers can influence the production of academic outputs.

3.4.1. Motivation, inspiration and competition

Friendly competition, mutual motivation and inspiration could have a profound impact on ECRs' experiences of producing academic outputs. For instance, Atticus described peer influence as highly motivational, and more beneficial for learning than working with more experienced colleagues with whom he had more of a mentoring relationship.

> *…at this point in time (there are) a couple of people who would be one slightly junior of me and one slightly senior of me, and I actually find working with those people to be really fantastic. I could probably learn a lot more from them than I do the senior colleagues sometimes, even though the senior colleagues have all the experience and stuff like that, there's a level of motivation and excitement that I think you get from working with people earlier in their career. So, I find that extremely valuable, and it's something I'm probably looking to do more of in the future as well.*

Peer influence was able to partially fill a support gap in that this influence was a valued resource, and Atticus felt somewhat vulnerable in his STEM profession without a mentor, noting that "you don't have a safety net there" without a mentor. In his Japan-based context, John shared Atticus' sentiments, explaining that

> *I think my colleagues, all my joint researchers, I also find very influential, for the other aspects, not just the fact that they have amazing skills, or they possess a key skill that I don't possess, or that is complimentary to my skillset, but the fact that they're hard working, or I see them achieving, and that kind of drives me to do that as well.*

As such, John did not just value his peers' capacity to supplement his own developing skills. He also drew inspiration from their work ethic.

3.4.2. Ideas and advice

Exchange of ideas with peers was also valued, and there was a sense that in some instances, this was perceived as a safer activity than communicating with mentors, with whom the power difference existed. Gloria noted that "there's one girl that I did my PhD with. We kind of went through it together, started at the same time, and, yeah, we would always kind of bounce ideas off each other, that sort of thing". Exchanging ideas and advice with peers could also support progress where mentors offered limited availability. Ideas and advice from more experienced peers could also help ECRs grapple with new procedures related to the production of academic outputs, with Aki explaining through the translator that she was able to draw on advice from supportive peers to learn how to submit journal articles through online submission platforms.

3.4.3. Writing

Like mentors, peers could also support writing skill development for ECRs' academic research outputs. For example, Barry explained that "if I were to send a write-up, a paper or whatever, he will definitely be coming back", delivering feedback for Barry to follow. Compared with mentor support of writing, peer writing influence was more likely to be reciprocal. Callie described one such reciprocal partnership with a peer.

> *But he's immensely supportive in terms of the academic outputs because we write … basically every single paper that either of us have written the other person's always been on, because we have so many science chats not specifically about, 'I have this idea, you should go test it,' but talking about things down the line and how to shape things and how best to communicate that, and what it actually means, and reigning the other person in, like, 'You cannot make that conclusion.'*

Such writing collaborations lacked the uneven power dynamic characterizing the mentor/mentee relationship, allowing ECRs to provide critical and supportive feedback to each other, building their writing skills in partnership.

3.4.4. Benchmarking and models

ECRs could also be influenced by peers that they had never met, using the benchmarking and career milestones of international peers to inform choices around decisions such as which journals to submit to, and also to determine their own performance in relation to academic output production. Calvin commented that

> *I think you need to look outside your own institutions, what is the state of play everywhere… For me, I'm a Level B. For a Level B academic around the world, what is the standard? So, I look up people's profiles and have a little look.*

He saw this as essential to prevent a sense of complacency and avoid an insular focus. Similarly, in his Japan-based context, John identified leaders in his field to emulate.

> *…so, you look at the leaders in that field, and you get to read their research. I've reached out to them through personal e-mails and things like that, testing, "I want to put this in your journal, what do you think about this?" And those people influence me in that they try to challenge me to be the best researcher that I can be.*

As well as using such leaders as a benchmark for his own performance, John also began to strategically form connections to seek advice and guidance from these more experienced individuals.

3.4.5. Friendship and emotional support

Peers could also be or become close friends, giving emotional support that can support ECRs to deal with the challenges of academic output production, including rejection of journal articles. While this could seem to be a tangential consideration in a paper focused on influences on research output production, respondents across both contexts identified this support as key to their production of academic outputs. Japanese respondent Tommy noted that "we chat every day about not only about the academic, very serious topics, but also the very casual and funny things [laughs], like the communication of the friend". These kinds of balanced work and personal relationships were also described as being mental health supportive. For example, Callie explained her relationship with a peer that she met during her doctoral journey.

> *She does quite different research from me… So, in terms of the technical side, we can't really offer each other much, but in terms of personal support, it's huge. Because she was maybe four months ahead of me PhD-wise, I can imagine things were quite difficult for her because she was the first PhD student of the entire research team when it first started…So we were kind of able to follow in her footsteps throughout our doctorate and everything that came up she was more than happy to say, "No, no, no, look*

here for the paperwork, you make sure you do this first, you have to do this, talk to this person, this person will help you. If this hasn't happened already, it's not going to happen, so you need to go and talk to X," which was fantastic. And now she's a really, really good friend of mine.

This comment further highlights that key relationships for ECRs do not always relate to research commonality, and that ECRs can find valuable peer and mentor support that meets their diverse needs, which may also help them to avoid pitfalls as highlighted by Callie.

3.5. Peer influence on translational outputs

There was only one salient theme that emerged across contexts in this area: provision of exemplars and advice on language use.

3.5.1. Provision of exemplars and advice on language use

Peers provided examples of translational outputs, and in particular, supported ECRs to appropriately grade their language and use appropriate communicative styles. Maria described this support as "giving me models, good models, of other published papers on *The Conversation* … Specific advice on how to use language, that sort of stuff". As a number of respondents explained that their mentors could not provide this support as they were not deeply engaged in the production of translational outputs, peers could potentially be the only source for advice and modelling at interpersonal level in some instances. Peers working in industry or professions could also provide valued advice on using appropriated graded language when seeking to communicate beyond academia. Aki's translator explained that "she'll ask, is this content too far from the clinical field? Yeah. Does it match, (is it) matching?".

4. Conclusions

Drawing on a social ecological model to explore support for fledgling researchers seeking to create research outputs for academic and diverse audiences, our previous research found that organizational and community supports were often more typically valued than supported. Supports at interpersonal level were also found to be inconsistent in this paper. The first key takeaway message from this paper is that while mentors may play an important role in supporting research output production for academic audiences through feedback, co-authoring and researching, encouragement and writing, they may do very little to support DCs and ECRs to produce research outputs for audiences beyond academia. While further research is needed to assert generalizability of these findings, universities should closely consider the extent to which production of translational research outputs are supported within the institution through mentor and peer influence. The second key takeaway message in that the kinds of supports experienced by and valued by ECRs may vary considerably, and serve diverse needs and purposes. To this end, research trainers and facilitators within the university to enhance mentor and peer influences available to ECRs with consideration of the kinds of valued support these sources can provide.

We found that supportive mentors of ECRs may often be former PhD supervisors who continue to support academic research output production beyond doctoral candidature, highlighting that the productive relationships that support DCs during candidature may continue to be drawn upon in early career. Where DCs have supportive mentoring supervisory relationships, their advantages over those without these relationships may be compounded beyond doctoral candidature. Therefore as a further key message, universities should support ECRs who do not enter this stage of their career with carry-over mentor support from doctoral candidate to find supportive mentors.

Quality of mentorship is also an important consideration. Our findings also suggest that mentoring support in reality could be more aspirational than actual, such as where a mentor is appointed, but neither mentor nor mentee have time and workload to meet, resulting in limited benefit for the ECR. There was also a sense that some of those without

mentors felt that this put them in a position of comparative vulnerability, suggesting that of all the strata of support, mentoring may be particularly valued by ECRs, though further comparative research is needed. Some ECRs also found sufficient support from peers or other mechanisms within the institution to negate the requirement of a mentor in their view.

More attention should be given to the role that peer influence may play in supporting research output production of DCs and ECRs, and how the university can foster positive peer relationships. We found that the more even power relationship when compared with the mentor/mentee dyad can allow unique supports to flourish. Motivation, inspiration and competition; ideas and advice; writing, benchmarking and models; and, friendship and emotional support emerged as salient themes, with the social and emotional aspects of these relationships drawn upon to support the pragmatic concerns of producing research outputs. Some peers were also providing support for production of translational outputs. While this support was limited to provision of exemplars and advice on language use, with such support not typically forthcoming from mentors, the role of peer influence in enhancing the effectiveness of DCs and ECRs seeking to produce translational outputs warrants further research attention.

We plan to conduct further research to determine the extent of generalizability of the trends that prevailed in this sample, which has provided the key foundational insights needed to progress this research, with particular attention to the under-researched consideration of how DCs and ECRs are supported in their production of diverse end-users beyond academia. We also note that ECRs may form valued relationships with diverse peers and mentors to support them in a broad array of facets relating to output production, from pragmatic co-authoring relationships to emotional and personal support roles. It is important to recognize the breadth of what ECRs perceive as support, so that institutions can better meet the needs of ECRs into the future, with consideration given to targeted training support in mentoring strategies for supervisors so they can further assist their students in relaying their research to diverse audiences. Finally, where mentoring is expected, both mentor and mentee need to be given time (as recognized in workload) to build this productive relationship.

Acknowledgements

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