Backing early career medical researchers: a philanthropic program for enhancing capacity in Victoria

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To maximize their impact, charitable foundations often seek to find and fund 'niches' of need that fit into a broader agenda of public policy. In Victoria, Australia, medical research is seen as a strength that not only underpins high quality health care but also contributes significantly to the State's economy. The sector therefore receives substantial government and philanthropic encouragement and investment. The Jack Brockhoff Foundation (JBF) intends that its endeavors should have a clear focus, measurable outcomes, and be more than 'just a drop in the ocean'. With a history of supporting medical research in several ways dating back to 1979, the Foundation in 2016 reviewed its method of supporting medical research and implemented a novel scheme for early career medical researchers working in Victoria (the scheme).

The policy objective adopted by the Foundation's Board is to strengthen research capability in Victoria to conduct world-class research in health and well-being by helping establish the careers of talented young scientists. As well as considering that founder Sir Jack Brockhoff wanted his philanthropy to enhance life opportunities for the young, advice from leaders in the medical research sector led to the scheme's focus on youth. Prior to launching the scheme, several members of the Board with connections into the medical research community canvassed opinion among research leaders on how, given limited resources, the scheme could best achieve its objective. It was assumed that after receiving their discipline-specific research training in a PhD program the most talented young scientists are ready to undertake independent research. Mostly, they have salary support won on academic merit and are usually employed on projects conceived and managed by a more senior scientist. In their post-doctoral period, they mostly work in relatively junior roles awaiting an opportunity to demonstrate originality and the capability to manage a research investigation from its conception as an original hypothesis, through its implementation to peer-reviewed publication. The niche that invited filling was not so much salary support as it was the funding and the time to allow early career researchers to explore evidence for their own original ideas. Funds to collect data and the time to manage a discrete project were believed critical to accelerating their journey towards making significant contributions to scientific knowledge and the experience to lead still bigger projects. The scheme was therefore designed to identify those most likely to succeed as medical scientists should they have the talent and motivation to do so. The scheme is in accord with the Foundation's strategic priority area Backing Big Ideas (www.jackbrockhoff.org.au).

The Jack Brockhoff Foundation Early Career Research scheme was first communicated to the research sector in 2015 as follows:

The Foundation seeks to help support early-career researchers to demonstrate their scientific originality and their capacity to complete, relatively independently, a discrete study for publication in scientific literature. The Foundation intends these grants to assist talented young researchers to build a CV that enables them later to compete successfully for research positions and research grants, and to establish the foundation of a career in medical research.

Details of the scheme and of the application form can be found at www.jackbrockhoff.org.au.

In brief, scientists who were awarded their PhD less than three years before the close of applications and are employed at an NHMRC accredited medical research organisation in the State of Victoria can be considered. Institutions are limited to two applicants per granting round. Applicants may propose a project of one- or two-year duration, with a budget (currently) of up to AU$75,000 per year. Host institutions are required to guarantee salary support for the applicant for the duration of the grant and commit to the applicant being able to spend at least 50% of their working time on the project. Host institutions are also required to attest that the idea for the study proposed is original to the applicant. The application must nominate an unconflicted scientific referee who provides a scientific reference confidentially to the Foundation.

A committee comprising three members of the Foundation's Board with appropriate medical/scientific credentials assesses the applications and makes recommendations to the Board for funding. From an administrative point of view, the application process and assessment are relatively streamlined and, other than the unconflicted reference, there has been no external assessment of grants. The application form is carefully structured to deliver material of most value to the committee which ranks and recommends for funding. There is also a totally open-ended question asking applicants to make their 'final pitch'. The final ranking of applications is done by consensus, rather than scoring on predetermined criteria. Having read all the applications, each committee member comes to the meeting prepared to declare their opinion as to whether each is either an 'A', 'B', or 'C', where A means 'An excellent application, I am very confident it is worth funding', B means 'a very good application but I could be persuaded either way ', and C means 'I am fairly sure this is not fundable'. There has rarely been disagreement as to which are Cs, and there has been a high degree of agreement about the As and Bs, even before discussion on their relative merits begins. The process of arriving at consensus on the quality of each application is usually completed within three hours. After ranking, budgets are tallied and recommendations made according to funds available

The period examined in this report is 2017 to 2023, although the scheme was suspended in 2021 due to impact of COVID. The mean number of applications received per year (excluding 2021) was 28. There is no age limit for applying, however applicants over 40 have been very rare. The average age of applicants was 33 years and about one in six had both a PhD and a medical degree. Approximately equal numbers of male and female applicants already had a medical degree, and these applicants were typically 5-6 years older than those without the medical qualification. During this period 51 grants were made, and the overall success rate for applications was 32%, and was essentially similar for male and female applicants. Grants were made to 27 women and 24 men. Successful grantees were employed by 16 medical research institutions in Victoria, and a total of AU$5,170,184 was granted over these years. Among the institutions applying to the scheme, 16 out of the 23 accredited institutions were successful at least once.

We report here an evaluation of the scheme using: 1) publicly available bibliographic data (publications and citations of those publications) and 2) survey data self-reporting achievements, experience, and opinions of grant recipients in the years following their award.

Method

Bibliometric analyses were undertaken at the University of Melbourne. The name and unique identifier (the ORCID - Open Researcher and Contributor ID) of 51 grant recipients was provided for analysis. In brief, this analytic tool accesses all the world's peer-reviewed scientific journal and book publications and can link designated authors to each publication. It also can link designated authors to publications cited by other scientific authors – a further measure of scientific impact.

Survey data responses were obtained from 46 of the 51 grant recipients, a 90% response rate. As the survey was implemented in 2023, the interval between receiving the grant and completing the survey varied from one year to six years. The questionnaire asked recipients to report on invited presentations about their project; peer-reviewed publications overall and those which arose from the Foundation's grant: if the funded study helped them to obtain further funding; if still employed at the same institution; if still employed in research; and whether they could suggest improvements to the scheme.

Results

Bibliometric analyses using the analysis tool SciVal (Elsevier. 2024, Accessed June 25, 2024) were conducted on all grant recipients i.e., 51 researchers. The total number of publications was 1452, and with an average of 29 per researcher. Restricting consideration to the 'articles and reviews' category, we found a total of 1286, showing that the vast majority of the written outputs appeared in the recognised scientific research literature, as expected. Every researcher had been cited in the literature at least 5 times, and the average, at 995, was much higher. Even after excluding two outliers (6973 and 10917 citations), the average citation impact of the group overall, at 645, was very high.

One bibliometric measure of the quality of research is the '% of output in the top 10% (field-weighted)". For each researcher, the proportion of their publications appearing in the world's most cited papers was calculated. The most impactful cited papers in the researcher's field were defined as those published in the same year and of the same type with a FWCI above the 90th percentile. Overall, one fifth of all articles published were in the Top 10% impact category. Eighty five percent of researchers (44/51) had published at least one article considered to be in the Top 10%.

The field-weighted citation (FWCI) impact of an individual's work is calculated as the average of the ratio between the actual citations a paper receives and the expected number of citations a paper published in the same year, of the same type and in the same field should receive. Only citations from the year of publication and those accrued in the following three years are included in the calculation. Field-weighted citation impact scores can range from 0 upwards, and a score of 1.0 indicates that a researcher's publications have been cited at the global average, meaning that regardless of experience, opportunity, or seniority, half the 'peer group' is above and half is below. A FWCI above 1 indicates that a researcher's papers have been cited more than would be expected. By the time this analysis was performed the median FWCI score was 1.6. Every JBF grantee had a score of 0.5 or more; 86% were above 1.0; 43% were above 2.0.

Survey data extended the bibliometric results with more qualitative information. Research results are often first presented to scientific peers at seminars and conferences. The survey question on invited presentations that were based on the funded study elicited data of limited value for this evaluation as respondents had different lengths of time in which to have received speaking invitations. There also appeared to be variability in the way the question was interpreted. Some respondents meticulously documented that the presentation related to the JBF-funded work whereas others appeared to have reported presentations on a wider range of topics. Nevertheless, there was evidence of considerable activity in making scientific presentations - all but seven had already given at least one presentation, and more than half reported speaking by invitation at international meetings. Among these, seven had presented their work overseas three or more times. A further caveat is that in the period 2020 to 2023 research conferences and therefore opportunities to present were seriously curtailed by COVID.

Respondents' listing of their peer reviewed publications and their comments on the most impactful publications complemented the bibliometric analyses above. Many respondents' offered statements of research impact specific to their JBF grant, and these appear in Appendix 1. Impacts described covered a wide range including contributions to fundamental biological knowledge; development of new methods that facilitate research in their field; direct clinical applicability of a new technique; translating research findings

into clinical care; patenting and commercialisation; drug repurposing; and release of a novel research tool that led to advantageous international linkages.
The publication lists also show how many other authors were involved and where the grant recipient came in the author listing. The most prolific author among those funded has a particular knowledge and skill base that is in high demand from collaborators. This person reported 147 publications since 2016, among which they were first author on two and another in which the person was one of over 100 authors.

A total of 34 of the 46 respondents (74%) reported that their JBF grant was 'significant in applying successfully for further research funding'. This probably underestimates the role of the JBF grants in generating further research opportunity and career impact, given that for the relatively recent grantees too little time had elapsed for JBF-funded work to have been completed, published, and used in grant applications. Most respondents claiming the JBF grant was significant provided details of the amounts of these subsequent related grants. The total amount reported was $43.3 million, which included nine researchers who had each been granted over $1 million. Two outliers contributed over half of the total between them - $5.9 million in one case and $18.5 million in the other.
Forty-one of the respondents (89%) were still employed in research and seven of these (17%) had moved to another institution, including one to Queensland and another to France, with the remainder still in Victoria.

Concerning ECR grantees who chose not to continue in research, no information is available on survey non-responders, however comments of those who had left or were planning to leave research are given in Appendix 2.

Respondents were asked if they had suggestions to improve the scheme. Most were highly approving of it in its present form and some made suggestions. Although they were not asked directly whether their award had a positive career impact, many were explicit on this point. Grantees attested to very favourable impacts on their research careers, sometimes quite effusively expressed. See Appendix 3 for comments that were volunteered.
Respondents were invited to make suggestions for improving the scheme. Five suggested that the scheme could extend to providing salary support for the grantee as well as the funds to conduct the proposed study. Several mentioned the possibility that JBF might host/co-ordinate more gatherings of awardees to promote networking and perhaps collaborations.

Discussion
In considering the success or otherwise of the Scheme, it is helpful to put it in the context of other cognate schemes and reflect on the Foundation's rationale for embarking upon it. Research-intensive Universities and Medical Research Institutes are very focussed in supporting PhD graduates who show significant promise in their research training period

of Honours, Masters, and PhD. But a successful PhD does not guarantee financial support as an early career researcher (ECR). An ECR is defined by Research Australia as a post-doctoral researcher with up to six years post-doctoral experience and mid-career researcher after up to a further 10 years, i.e., a total 16years (https://researchaustralia.org/reports/supporting-early-and-mid-career-researchers/). In Victoria, Monash University considers ECR support for up to 10 years post PhD, while University of Melbourne it is up to five years. At University of Melbourne, the support is determined at a faculty level, with grants of $40,000 for one year provided the post-doctoral researcher has a salary from the University. Australia wide, the Australian Research Council (ARC) have a Discovery Early Career Researcher Award (DECRA) award scheme for 200 ECRs that provides the ECR of up to five years post-doctoral with up to three years funding with their salary, plus $50,000pa towards research costs. These awards are highly competitive across the broad areas of science and humanities funded by the ARC. There are other small support schemes from philanthropy that offer travelling scholarships and prizes from medical research societies to support outstanding ECRs in payment of registration, travel, and memberships. Much of the philanthropic support is from disease-specific organizations, such as cancer societies.

So why did we consider supporting up to three-year post-docs, with the criteria that they must have a salary from their NHMRC-accredited institution and protected time of 0.5 EFT to concentrate on the project supported by this scheme?

At the outset it may have seemed quite a big 'ask' of the institution providing the salary to allow the applicant the opportunity to pursue their own scientific study within the organization's busy research agenda. The institution would need to accept autonomy for relatively junior researchers with a mentor guiding their project but not directing it. In the event, the research institutions in Victoria wholeheartedly supported the scheme as evidenced by the number of post-doctoral researchers applying. In some cases where there were many potential candidates, institutions conducted internal competitions for the right to apply (given the limit of two applications per institution). Early on, one institute director wrote approvingly as follows: "The Jack Brockhoff Early Career Research Grants are competitive and valuable opportunities that enable applicants to lead an independent research project at a pivotal time in their career. On behalf of (my institute) I thank you for your vision and foresight in supporting our future scientific leaders".

We sought to assess the success of the scheme from two perspectives: objective data on scientific publications authored by the grantees and self-reports from the grantees themselves. There was clear evidence overall that the JBF grantees have done very well as young scientific authors – most are already well advanced in comparison to the global peer group working in the same scientific field. This suggests that the scheme is indeed contributing to the building of medical research capacity in Victoria, as intended by the

Foundation. Support for this conclusion also comes from the fact that, although well-travelled to international conferences to present their work, the vast majority remain employed in research in Victoria.

While we found bibliometric data to be useful in assessing overall achievement, we need to be cautious in judging individual achievement on citation impact alone. Even within fields we saw variation that is better explained by opportunity to collaborate, for instance on multi-institution studies and multi-authored publications, than by differences in scientific ability. By their nature, some research problems require more varied sources of data and more varieties of expertise than others, and this tends to multiply the number of authors, each carrying a relatively lighter load in terms of conception, execution, analysis, and writing up of the study. There appears to be no easy way to level the playing field when comparing the scientific output of individuals. That judgement will always depend on expert informed assessment of individuals, their field and methods, and the research setting in which they work.

While it is no doubt true that more money and more time will likely produce more results, our findings confirm that regardless of limiting grant funding to two years and only to very recent post-docs the scheme has produced a significant quantum of new scientific knowledge. We therefore see no reason at this stage to change those basic conditions of the scheme.

The high response rate to the survey is pleasing, particularly as the possibility of selection bias around scientific performance can be ruled out: the six non-responders appear to be actively publishing, and indeed each had a FWCI score equal to or above the median of survey responders.

Comments from respondents on the scientific impact of their research show considerable depth and breadth of endeavour, ranging from fundamental studies in laboratories to clinical studies of in-hospital treatments. That the range of human diseases addressed was quite wide is not surprising since the scheme has no constraints other than that it must be relevant to the health and well-being of the population of the state. We do, however, acknowledge the wish of founder Sir Jack Brockhoff that, all else being equal in terms of scientific merit, preference will be given to studies that are of potential benefit to the young.

Three quarters of the respondents reported that the research conducted with their JBF grant had already been significant in later success with grant applications to other bodies. Not only did they add lustre to their CV, but they also brought substantial funds from nationally (and internationally) competitive schemes into Victoria, further building capacity in the sector. By way of perspective, the total amount claimed to be related to the JBF

studies ($43 million) exceeds the entire annual budget of many of the institutes receiving grants in the scheme.

Of the few grantees who had left research, two expressed disillusionments with the research environment they had left, and one was influenced to do so by the demands of family. The suggestion was made that the Foundation include provisions in its grant to accommodate changing family responsibilities, particularly for female researchers. Whilst this is desirable for reasons of equity and productivity, we choose to treat employment conditions as a matter for the employer, not the funding agency. That the scheme requires the grantees only to spend 50% of time on the JBF-funded study leaves room to accommodate individual circumstances. To the best of our knowledge, the organisations funded by our scheme already have 'family friendly' employment conditions.
Most respondents expressed strong support and gratitude for the scheme, and only a few made suggestions for improvement. Suggestions that are actionable will be considered for future granting rounds.

Since the scheme was launched, several philanthropic partners have joined by contributing an amount equivalent to the budget of one or more grants. The partners have a choice of which to fund among the recommended projects, and they pay the required amount directly to the grantee's host institution. The Foundation seeks no financial contribution towards the cost of running the scheme. For the most recent funding cycle, there are two partner philanthropists – The Mazda Foundation and the Peter Griffin & Terry Swann Foundation. Partners in previous rounds were the Marian & EH Flack Trust and Dr John McBain. Such is the quality of applications that we estimate that it would be worth supporting double the number currently supported, hence there is scope for additional partners to join the Foundation in this enterprise.

Conclusions
A competitive, novel scheme to fund medical research to be undertaken by very recent PhD graduates appears to have achieved its major policy aim of accelerating careers and building capacity in the medical research sector in Victoria. Evidence of this included bibliometric data on publication performance, follow-up self-report surveys of grant recipients, and anecdotal accounts of assessments from senior research leaders.

APPENDIX 1

Grantees' statements of research impact work undertaken with their JBF grant.
"most impactful (of my papers) – speaks to biology of myloid changes clinically observed with venetoclax".

"first to identify that intact potentially competent HIV proviruses reside in the brain of people with HIV who are virally suppressed with anti-HIV therapies".

"this study showed us the brain mechanism (serotonin 2C receptor) that is driving craving in humans with alcohol use disorder".

"this study made a discovery that improves our understanding of skin disease and identified a new target for disease treatment".

"combined multiple high-resolution mass spectrometry datasets for post-translational modifications analysis and global quantitative proteomic analysis to shift a paradigm regarding methylation in eukaryotic evolutionary biology".

"our protocol and pipeline allow quick (3 day) and complete sequencing of heavy and light antibody chains at a fraction of the price from commercial providers, thus improving practice for the development of antibodies in research, diagnostic and therapeutic use (and it) has been picked up by multiple users from major international universities".

"(the paper reporting) the clinical trial funded by the JBF grant demonstrates that there is potential to provide supportive therapies to slow down (glaucoma) and prevent some of the damage this disease can induce".

"characterises the relationships between the microbiome, gut inflammatory response and severity of cardiometabolic disease in a mouse model of metabolic syndrome. Moreover, it makes important comparisons between the sexes, shedding some light on why males and females respond so differently to obesity".

"first study to show AMPK is regulated by the metabolite palmitoyl-CoA and has been widely accepted in the field".

"this manuscript was the subject of an editorial (in a journal with impact factor = 19) acknowledging the quality and importance of the findings".

“was first to utilise multiple large scale omics approaches to understand disease pathology…and it identified mitochondrial pathway deregulation was strongly associated with late-stage AMD (geographic atrophy)”.

“shows for the first time the dynamic proteome and lipidome changes of the lipid droplet during virus infection”.

“provides strong evidence for the feasibility of UCB (umbilical cord blood) administration in a clinical setting/clinical trial, whilst also highlighting the necessity for UCB expansion in some cases”.

“provided important information about treatment strategies that may help improve the treatment of women with this highly common vaginal infection”.

“this work is based on the JBF funding and it is being translated by an industry partner which has patented this work where I am listed as the inventor”.

“the first evidence that dimethyl fumarate, a drug currently indicated for multiple sclerosis and psoriasis, could be repurposed as a therapy for Duchenne muscular dystrophy”.

“first evidence that cognitive subgroups (in the schizophrenia-bipolar spectrum) are not artefacts of the measures used to define them, but instead likely represent the outcome of different cognitive trajectories”.

“we built a world-first epigenetic clock for human skeletal muscle and made it accessible as an open access R package…(after which) many research groups reached out to us”.

“I believe this will be a very impactful paper given its key findings showing sex differences in alcohol consumption and that this may be driven by changes in bitter taste sensitivity”.

“adds to the evidence that age-related hearing loss begins as early as the first decade of life”

APPENDIX 2

Grantees' reasons for planning to withdraw from medical research

"I am currently still employed as a medical researcher; however, I am in the process of upskilling to change my career – I have found the medical academia landscape very cut-throat, despite having great funding and publication success, I feel that it is no longer fulfilling for me. This became especially apparent after having my two children and realising that I was not going to be able to adequately juggle the requirements of lab-based projects with caregiving to achieve the level of success required to continue in the field".

"The reason I left academic research and do not plan to return is because I feel the research environment in Australia is not good, researchers are not treated well and extremely hard for researchers to start a lab".

"I have returned to clinical practice and have started a consultancy. I would consider returning to research for the right role but not at the current time".

"I'm still in academia but have taken on a role that is more education focussed".

"I was unable to secure funding to continue my post-doctoral role and have now moved to a teaching/clinical role. I invested significant time and effort to upskill in this new role. The position is ongoing with a secure salary, which would be impossible in a research role".

APPENDIX 3
Grantees' comments on career impact of receiving a JBF early Career grant

"provided me with an invaluable opportunity to expand and progress my research career". "I unequivocally believe that the Jack Brockhoff grant helped me launch my career in Australia. Whilst I had previous success in the UK, it can take a bit to break into the Australian grant landscape – and this award gave me the perfect opportunity to do this and establish myself".

"I am extremely appreciative of the JBF and found it a great process…as research projects often take significant time and can be delayed for many reasons, I would suggest extending the reporting process to account for this".

"is a fantastic scheme. My suggestion is to continue to support this program and understand the opportunity it creates for post-docs who are struggling to secure funding, specifically via the NHMRC. It is my opinion that NHMRC early career awards favor clinician-scientists over scientists. Although I am a clinician- scientist, the pure scientists are left out. The JBF early career grant helps fill this gap..(because) the Jack Brockhoff committee seems to have a bit of a different lens (to) NHMRC. I would suggest JBF consider excluding NHMRC grant holders from eligibility".

"has been a fantastic way to 'jump start' my career".

"the scheme is excellent and certainly contributed to my success in receiving further research funding and maintaining a career in research".

'thought it was a fantastic scheme that boosted my confidence and kept me in research at a time when I was considering leaving".

"longer term fellowships to support post-docs into research leader positions would be fantastic. Substantial attrition from senior post-docs leaving science due to lack of job security and lack of promotion options".

"from my personal experience and watching those around me who have gotten (a JBF grant), there isn't anything I can see to change. It provides such a boost to ECR's careers to get Chief-Investigator-A funding. I have watched the JBF funding have impact on multiple people's careers".

"amount provided is exceptionally helpful to early career researchers and has allowed me to perform ambitious and costly experiments that I would not have been able to consider otherwise".

“I do think the short duration of the grants is a positive aspect of the grant, as it makes it more feasible to be successful for this grant. The grant has enabled me to work extensively on an exciting new project … and be employed for two years at the same institution”.
“the process relative to reward was highly favourable and not at all onerous”.

“facilitated me to gain further funding and research independence, (so) I was able to secure a full-time (ongoing) position”.

“I think the scheme is fantastic. It provides a great kickstart to an ECR’s career…I am really proud to have been a JBF recipient and feel a part of the JBF family”.

“I think the scheme is very well managed…the application process is very user friendly, and the management of the grant and reporting is very easy and straightforward to follow”.
“these seed funding initiatives are fantastic for ECRs in Victoria enables them to develop their own ideas and greatly advances their career progression”.

“provided me with a generous opportunity to establish some independent research, which was greatly appreciated as an ECR in an increasingly competitive and funding-poor environment. The application procedure was simple, the award ceremony was really lovely and welcoming, and overall, I was very honoured to be a JBF grantee”.

“is a great scheme and a very big reason why I was able to secure my fellowship. Obviously, money is tight, so if grants were able to be at least partially spent on salaries that could help”.

“JBF has been a great supporter of my career”.

I am incredibly grateful to the Jack Brockhoff Foundation/scheme for their support in the early stages of my career which has undoubtedly played a role in my subsequent success”.
“very important for early career researchers like myself, enabling a smooth transition into becoming independent researchers”.

“only suggestion would be to allow specific funding to support travel/carer responsibilities for ECRs who are young females…this would help sustain the productivity of younger women researchers”.

“it provides a springboard to become an independent researcher. There are very few opportunities for ECRs under three years - this is a strength of Brockhoff to provide opportunities for early stage ECRs”.

"consider offering more flexible funding options, such as seed grants for pilot studies or bridge funding to support researchers during gaps between major grants".

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