CANADIAN PSYCHOLOGICAL ASSOCIATION

SOCIÉTÉ CANADIENNE DE PSYCHOLOGIE

CANADIAN PSYCHOLOGICAL ASSOCIATION SUBMISSION TO CANADA'S FUNDAMENTAL SCIENCE REVIEW

PSYCHOLOGY RESEARCH IN CANADA

Submitted September 30, 2016

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EXECUTIVE SUMMARY

Psychology is a health, social and natural science, and a discipline that recognizes that science and technological advances must be based upon evidence. It is a fundamental discipline solidly established as contributing to the core mandates of each of the granting councils. Within the context of the following four categories, this paper provides an overview of the challenges facing psychology researchers in Canada.

Funding of Fundamental/Investigator-led Research – The issues facing investigator-led research are widespread, and include: inequity in the distribution of funds to the three granting councils; funding investments that have been targeted or directed towards specific programs of research rather than for existing general programs within the three granting councils; steady fall in the success rates for the granting councils; insufficient funding for research projects that cross-cut two or more funding agencies or that show evidence of collaboration between research that spans funding agencies; insufficient funding for non-biomedical research specifically, and health research in general; difficulties finding the right number of reviewers with the appropriate subject matter expertise to support a rigorous peer review process; decisions being made without proper consultation with the research community; shift to give a smaller number of large grants, rather than a larger number of moderate grants to many researchers; more support for women in science; and challenges faced by smaller institutions.

Funding of Equipment and Facilities – Issues within this area include: the need for stable and predictable funds for research infrastructure to support the short and long term operational and maintenance requirements of new and existing research facilities; the availability of stable and rolling funds for the timely funding of smaller-scale equipment and equipment needed to pursue rapidly emerging research directions in individual laboratories; and the need for an unbiased, transparent, and independent, Science Office.

Support for Students and Early Career Scientists – Identified issues for students include: the need for increased funding for scholarships; awarding a greater number of moderate scholarships to more students; in the case of NSERC, providing funding for two years of masters training; increased funding for internships; a more streamlined process for internship funding; more internship opportunities in federal departments, within industry, and within settings that do not have an economic focus; increased funding for post-doctoral fellowships; and in the case of NSERC, restoring the number of times one can apply for a fellowship to two (from one).

Disseminating Research Knowledge – Issues within this section highlight the need for careful consideration of the merits of open access publications on researchers, peer review systems, and publishers; careful consideration of open data initiatives, so as not to render publicly funded data useless or violate the ethical standards under which the data was initially collected; and the need to evaluate the different ways that knowledge can be mobilized, how its impact can be assessed, how it needs to be directly funded, and what training is required to both support and evaluate knowledge mobilization plans.

ABOUT THE CANADIAN PSYCHOLOGICAL ASSOCIATION

The Canadian Psychological Association (CPA) is the national association for the science, practice, and education of psychology in Canada. With over 7,000 members and affiliates, the CPA is Canada's largest association for psychology, representing students, scientists, and regulated practitioners, with subject matter expertise in over 33 subject matter areas.

Organized in 1939, incorporated under the Canada Corporations Act, Part II, in May 1950, and in receipt of its Certificate of Continuance under the Canada Not-for-profit Corporations Act (NFP) in August 2013, the CPA's mandate is to: 1) improve the health and welfare of all Canadians; 2) **promote excellence and innovation in psychological research, education, and practice;** 3) **promote the advancement, development, dissemination, and application of psychological knowledge**; and 4) provide high-quality services to members.[1]

PSYCHOLOGICAL RESEARCH

Psychologists relying upon the scientific method have substantially advanced our understanding of how people think, feel and behave. This understanding provides the foundation for psychologists[2] to apply this knowledge to help people understand, explain and change their behaviour. Research in psychology can be applied to individuals, groups, families, communities, and in some cases, non-human animals, as well as larger organizations in government and industry.

The core dimensions of fundamental psychological research are the domains of cognitive science, behavioural and health science, and social science. Within these domains, psychologists acquire many abilities and skills through their training, that serve their capacities to engage in psychological research well, including but not limited to: the ability to analyze problems and think critically; the ability to interpret and evaluate research, including statistics; an ability to design, conduct and manage small- and large-scale research projects; skills in data collection and analysis; theoretical grounding; professional writing; knowledge translation; an understanding of advocacy and public policy; an understanding of the genetic, biological, and social influences on behavior; and a sensitivity and awareness of interpersonal, developmental, and cultural differences.

The "core competencies" and research skills arising out of bachelors, masters, and doctoral training (PhD, Ed.D., and PsyD) in psychology position graduates to pursue varied careers, including but not limited to health services, academia, top- and mid-level management, consulting, administration, statistics, labour-relations, personnel and training, business services and marketing. More specifically, some psychologists work primarily as researchers and faculty at universities, while others work as

[1] See Appendix A for an overview of some of the activities the CPA undertakes to fulfill its mandate.
[2] CPA is reserving the title psychologist for those who hold a doctoral degree in psychology; some of whom are licensed health care providers and others who are researchers, university faculty, or otherwise employed across the private and public sectors.

practitioners in hospitals, schools, clinics, correctional facilities, military organizations, employee assistance programs, and private offices. Increasingly, many psychologists hold positions in government, non-government organizations, and private industry. Others work as consultants to corporations and various organizations. Advanced education in psychology provides rigorous training in research; hence, those trained as scientists or practitioners inform their work with a research based understanding.

Objectives of Submission

Psychology is diverse in its scope and the research methods it uses. Psychological research has broad and significant application to the well-being of Canadians and their communities, creating an understanding of people, human problems, and the many environments in which we live. Psychology is a health, social and natural science, and a discipline that recognizes that science and technological advances must be based upon evidence. It is a discipline whose research cross-cuts and meets the mandate of each of the three federal granting councils [Social Sciences and Humanities Research Council (SSHRC), Natural Sciences and Engineering Research Council (NSERC), and Canadian Institutes of Health Research (CIHR)] and other federal funding [e.g. Canada Foundation for Innovation (CFI), Mitacs)]; and whose field of study, by its very nature, is inter-disciplinary; in a 2012 report of the Canadian Council of Academies, *The State of Science and Technology in Canada*, psychology and cognitive sciences was among six research fields in which Canada excelled in a global context.[3]

The CPA is pleased to provide its input into Canada's Fundamental Science Review being overseen by Minister Kirsty Duncan, Minister of Science. Within the context of the following four categories, this paper provides an overview of the numerous challenges that are affecting Canada's psychological researchers, as well as recommendations to address some of the issues.

1. Funding of Fundamental/Investigator-led Research
2. Funding of Equipment and Facilities
3. Support for Students and Early Career Scientists
4. Disseminating Research Knowledge

[3] The six research fields in which Canada excelled were: clinical medicine, historical studies, information and communication technologies (ICT), physics and astronomy, psychology and cognitive sciences, and visual and performing arts.

FUNDING OF FUNDAMENTAL/INVESTIGATOR-LED RESEARCH

Psychological research has broad and significant applications to the well-being of individual Canadians, businesses and communities, creating an understanding of people, human problems, and the many environments in which we live. It is paramount to supporting our nation's success, having relevance to societal well-being, health, technology, innovation, productivity and the economy. How well people manage chronic disease, how employers optimize workplace satisfaction and productivity, how we understand the developmental issues and problems of childhood and aging, and how we effectively treat mental disorders are informed and advanced by psychological science.

Funding for basic psychological research via the granting councils, as well as stabilized funding for operating and infrastructure support, are critical to improving the health and well-being of Canadians, ensuring the success of the organizations and communities in which they live and work, and cultivating a strong science culture upon which the development of good policy and programming is based. A strong science culture will, in turn, embrace discovery, engage in evidence based decision-making, encourage the education and training of a highly skilled workforce, promote the development of an innovative knowledge-based community, and secure Canada's place as international science destination.

Funding and Peer Review Challenges

Psychology is a fundamental discipline solidly established as contributing to the core mandates of each of the granting councils. Unfortunately, the granting councils, which are widely admired internationally and form the bedrock of support for research in Canada, have not been as stable of late in terms of how research is funded, reviewed and awarded. Recent years have seen numerous challenges as relates to funding and peer review – some of these challenges are described below and in the pages that follow.

1. **Inequity in the Distribution of Funds to the Tri-Council Funding Agencies**

SSHRC has seen the largest reduction in funds since 2007 and gets the least amount of absolute funding and also the smallest increases, despite the fact that social scientists represent over half of Canada's researchers. Social sciences and humanities research provides essential information on social, cultural, psychological, economic, technological and health-related issues; thus, they are fundamental to answering key societal questions that in turn inform public policy. One can argue that success of any basic science development can be measured by its application and implementation. Application and implementation depend precisely on the research of social scientists; research which examines the behaviour of individuals, groups and organizations.

2. **Funding Investments that have been Targeted or Directed Towards Specific Programs of Research Rather than for Existing General Programs**

SSHRC is overseeing the Canada First Research Excellence Fund for which billions of dollars were invested by the previous government; these specialized grants are meant to fund projects, put forth by universities, that do not meet the criteria of an individual granting council. Targeted research is needed so as to answer specific questions. However, there is also need for funds for the granting agencies existing general programs that support basic research (e.g. SSHRC's Insight Grants, NSERC's Discovery

Grants, CIHR's Open Grants). Basic research, characterized by short and long timelines, is able to define, validate, challenge, and resolve important questions; lead to significant advances; and attract and develop world-leading research teams whose activities will produce top scientists, professionals, students, and post-docs.

3. Steady Fall in the Success Rates for the Granting Councils

Decreased funding levels and, in some cases, flawed and/or inadequate review systems have resulted in many researchers rated highly by demanding standards of excellence being turned down each year for lack of funding, despite having been rated highly by standards of excellence. For example:

- In 2015-16, about 25% of Canadian researchers in the humanities and social sciences received funding from SSHRC (or about 14% counting only primary investigator), a rate of coverage that has been stable for the past 10 years.
- Insufficient funding for health-related research as evidenced by a 13% success rate in the CIHR 2016 Foundation and Project Grants competitions. Investments in health-outcomes research are needed to improve our ability to understand and treat illness and develop effective preventive efforts.
- Over the past decade, NSERC has managed the funding deficiency by reducing or holding the value of the research grants flat in nominal dollars. The ability of NSERC-funded researchers to conduct research and, most importantly, to support graduate students, has been seriously affected, particularly when effects of inflation are factored in.

4. Insufficient Funding for Research Projects that Cross-Cut Two or More Funding Agencies or that Show Evidence of Collaboration between Research that Spans Funding Agencies

Although psychological research cross-cuts all three funding agencies, it does not do so in a manner that easily fits into the siloed nature of funding agencies. Psychology researchers can (and sometimes need to) simultaneously apply to two or three funding agencies. Further, while inter-disciplinarity and collaboration in scholarship are widely encouraged, there are no cross-institutional funding envelopes. For example, a researcher looking at the *influence of workplace policies on workplace mental health and productivity*, could reasonably look to at least two funding agencies for support. Choosing the wrong agency results in a proposal being rejected out of hand, with no scientific review, which would delay the project for a full year, even assuming a re-application to the other agency was successful. Also, and perhaps more importantly, a proposal that addresses issues of relevance to two or more of the agencies might not be able to address the strict criteria for any one of them; so even if a researcher decides to apply to one of them, they are not likely to be funded. Along these lines, one might query if the current model of three distinct funding agencies that force our research into siloes continues to be the best model for research funding in Canada, when so many ideas and findings clearly flow across disciplines.

5. Insufficient Funding for Non-Biomedical Research Specifically, and Health Research in General

CIHR is the major federal funding agency supporting health research in Canada. The work of its 13 institutes reflects four pillars of research (biomedical; clinical; research respecting health systems and services; and the social, cultural and environmental factors that affect the health of populations).

Proportionally, psychology and mental health related research is significantly underfunded with the majority of grants going to research that is biomedical in nature. By way of example, CIHR's 2016 Foundation and Project Grant Competition reported a 13% success rate – of 120 Foundation Grants, 491 Project Grants, and 127 Bridge Project Grants, less then 9% of awarded funds were for studies related to psychology/neuroscience/mental health/addictions.

It had been a common understanding that one of the charges to CIHR following from MRC was to support a broad range of health research.[4] With less than 9% of awarded funds directed to other than biomedical research, it does not appear that CIHR has realized this mandate. Mental health and mental illness are complexly determined, chronic and recurrent conditions. While researching the neurobiology of mental disorders and the application of pharmacotherapeutics are important, so too are the social and psychological factors that contribute to the development and maintenance of illness and are established ingredients to recovery from illness. Mental illness costs Canadian society $51 Billion annually; this alone is financial incentive enough to address mental illness in all its biological, social and psychological dimensions.

6. Difficulties Finding the Right Number of Reviewers with the Appropriate Subject Matter Expertise to Support a Rigorous Peer Review Process

Peer scientific review is at the core of respected science, yet there are serious deficiencies in the Canadian system. CIHR's inadequate scientific peer review process has generated numerous complaints. NSERC's former Discovery Grant review process was seen as superior to what currently exists. In contrast, SSHRC's review system is positively received. The CPA supports in-person meetings when possible to adjudicate grants, but acknowledges that in some cases, there can be value in virtual elements within the peer review process. Each Council that implements a peer review process, must ensure that the process will ensure the best and fairest outcome for those grant proposals worthy of funding.

7. Decisions Being Made without Proper Consultation with the Research Community

Researchers and the research community have also experienced the negative effects of decisions being made by one or more of the funding agencies without proper or sufficient consultation. For example, in the case of psychological scientists, the CPA has noted the following: an agency arbitrarily deciding that psychologists or their students are not eligible for an award (see Appendix C); agencies deciding where psychology best fits (e.g. SSHRC versus CIHR, not NSERC); poorly explained and unjustified decisions that larger awards should be favoured over smaller awards; decisions that lead to new researchers struggling; arbitrary decisions that one year of funding rather than two would be sufficient; and unjustified decisions that funds should be used first for the "hard sciences" with social science research being deemed as less important. These unfortunate practices and decisions have frequently required CPA responses in the form of lobbying, letter writing campaigns and data collection to demonstrate the

[4] http://www.cmaj.ca/content/162/7/1029.1.full

negative ramifications of these decisions. In some cases, careful reasoning led to the decisions being overturned.

8. Systemic Shift to Give a Smaller Number of Large Grants to Elite Researchers rather than a Larger number of Smaller Grants to Many Researchers

In 2013, Fortin and Currie[5] published an analysis of NSERC data that confirmed the benefits of an equitable distribution of resources to a diverse array of researchers, instead of large and targeted investment in only a few elite laboratories. The conclusion follows from the fact that a researcher's scientific impact (e.g., number of publications, number of citations) changes at a decelerating rate of return, where each additional dollar granted produces a smaller incremental benefit.

9. Challenges Faced by Smaller Institutions

A recent paper published by Murray et al. (2016, PLOS One)[6] shows that funding success and grant amounts awarded by NSERC's Discovery Grant program are worse for applicants from small institutions; a pattern that is stable over applicant experience levels and consistent over all three evaluation criteria. Unfortunately, the analysis predicts that if the current funding success rates are projected forward, science funding at small schools in Canada will decline precipitously in the next decade. On the positive side, the authors make recommendations that could help to close the gap; for example, adopting blind review of research proposals.

In addition to the above challenges, researchers have noted particular challenges for women in obtaining grants; heavy administrative and reporting burdens on grant recipients; and funding agency mandates that prohibit private practitioners, consultants, and qualified researchers affiliated with professional associations that are often not-for-profit (such as the CPA), from applying for research – in the case of the latter, societies may have contributions to make, both financially and in-kind to research, particularly as pertains to knowledge mobilization, that could be realized with some external funding.

Challenges Facing Psychology Departments in Universities

Recognizing that education falls within the provincial purview, one cannot discuss the capacity of today's academics to conduct fundamental research, which relies on federal funds, without discussing some of the challenges facing today's universities. Some of the challenges facing psychology departments are noted below – note that many of the challenges are not unique to the discipline of psychology, but are challenges being faced by many disciplines, particularly those in the social sciences and humanities.

[5] Fortin J-M, Currie DJ (2013) Big Science vs. Little Science: How Scientific Impact Scales with Funding. PLoS ONE 8(6): e65263. doi:10.1371/ journal.pone.0065263

[6] Murray DL, Morris D, Lavoie C, Leavitt PR, MacIsaac H, Masson MEJ, et al. (2016) Bias in Research Grant Evaluation Has Dire Consequences for Small Universities. PLoS ONE 11(6): e0155876. doi:10.1371/journal.pone.0155876

- Lack of funds and positions with which to recruit and retain new graduates and faculty on a full-time basis. Graduates with doctoral degrees are being engaged by universities on contract to teach sessional courses, leaving them with low very low annual incomes and no employment benefits.
- Lack of faculty to teach core and required courses, thereby requiring students to find alternative ways to meet their training requirements (e.g. online course)
- Reduced enrollment in some Bachelor of Arts programs despite the fact that Introduction to Psychology is often a university's most heavily subscribed undergraduate course
- Need for resources to develop and/or add to existing university curricula so that students can be exposed to alternative career paths, as well as obtain practical experiences in communication, public policy, and management.
- Lack of recognition amongst employers for the skills acquired as part of one's doctoral training

The CPA is in active discussion with psychology department representatives across the country, as well as representatives from other disciplines on the above issues, and will remain a steadfast advocate on behalf of psychology researchers and educators.

RECOMMENDATIONS:

The current government is to be commended for its budget 2016/17 investment in fundamental research to the tri-councils, and particularly to SSHRC. Should the government continue with yearly 3% funding increases for the next three years, by 2020, the granting councils' funding should be restored to the 2007 levels – of note, there would still be an imbalance in the funds to SSHRC. Budget 2016/17 began to address SSHRC's funding gap relative to the other granting councils, and this process should continue for the next three years. Overall, to keep pace with competitor countries, larger investments in fundamental research are needed, as are improvements to our peer review systems.

FUNDING OF EQUIPMENT AND FACILITIES

Research Infrastructure

Canada can be proud of its investment in some aspects of its research infrastructure. For example, Compute Canada (https://computecanada.ca) offers high performance computing resources to Canadian scientists free of charge, providing them with the tools they need to compete on the world stage in computational neuroscience, formal analysis, and artificial intelligence. In another example, Ryerson University recently received $36.3 million to build a new Centre for Urban Innovation, and modernize/upgrade research laboratories and infrastructure in Ryerson's science, engineering, and design buildings. Unfortunately, not all infrastructure has been well supported. For example, the decision to terminate the MRI facilities in the National Research Council Institutes for Biodiagnostics (NRC-IBD) in Winnipeg, Calgary, and Halifax had many negative effects. First, tools and trained technicians were no longer available to our researchers. Second, university-based research programs that had depended on the neuroimaging equipment and technicians in the NRC-IBD were severely disrupted, and in some cases, ended. Third, science/industry partnerships were severely impacted. For example, shutting down the MRI research equipment in NRC-IBD Winnipeg precipitated the relocation of a world- class biotechnology company (i.e., IMRIS, http://www.imris.com/) to Minneapolis.[7]

We encourage the Government of Canada to recognize and maintain its existing assets as it works to build new ones. It makes little sense to decommission existing research infrastructure known to foster research innovation and industry partnerships while calling for advice to improve Canadian research capacity and industry partnerships. Stabilized operating funds for universities, government departments, and various data collection agencies are needed to maintain research infrastructure, support data management, and continue to conduct research.

Investments have been made in research infrastructure to cover indirect costs associated with conducting research, as evidenced by funds allotted to the Canada Foundation for Innovation (CFI) by the previous government, to universities doing federally-supported research by the current government, and to previous iterations of the Indirect Research Costs Program. However, more stable and predictable funds beyond these are needed. It is critical to support the short and long term operational and maintenance requirements of existing regional, national and international research labs.

Funding for Equipment

In addition to funding for indirect research costs, each tri-council needs to ensure the availability of stable funds for the timely funding of smaller-scale equipment and equipment needed to pursue rapidly emerging research directions in individual laboratories. For example, NSERC-relevant psychology researchers have noted the difficulty in getting NSERC to appreciate that psychology has needs for funding for expensive equipment; one member noted that the same research project on language

[7] http://www.cbc.ca/fifth/blog/federal-programs-and-research-facilities-that-have-been-shut-down-or-had-th.

learning submitted to NSERC's Computer Science Committee would get more funding than if it went to the Psychology committee.

In 2012, NSERC announced the cancellation of its Research Tools and Instruments (RTI) envelope following its 2013 competition; this was a fund specifically for use for equipment as described above. With its cancellation, researchers were told to apply for funds for equipment from CFI. However, this was not a viable solution as individual researchers cannot apply for funds for small-scale equipment through CFI; it only funds institutions. The CPA was one of many associations to respond to this on behalf of its members; in response, NSERC reinstated a semblance of the RTI – funds were made available for equipment, albeit not from a dedicated equipment fund but rather from surplus NSERC funds. Since then, it is the CPA's understanding that stable funding for small scale equipment is being allotted by NSERC. In a similar fashion, CIHR also announced that equipment could not be funded through its Foundation and Project Grants. The CPA again advocated against this on behalf of its members, and was subsequently informed that CIHR had changed its rules to allow equipment funds to be included in its recent Foundation and Open Project Grants.

Scientific tools are a necessary component of basic research and any decrease in funding for such tools is ultimately counterproductive. The CPA appreciates that the funding councils have sought ways to find savings in the past as part of the previous Government's efforts to return to balanced budgets. However, Government and Canadian stakeholders are also committed to a thriving and successful society and economy – the advances and innovations of basic research are central to achieving these objectives. Not funding equipment or cutting programs such as the RTI compromises research and undermines one of the fundamental aims of the funding agencies themselves.

Research in Non-Academic Settings

It is also important to provide sustained support for the continuation of research in non-academic based settings such as but not limited to:

- Statistics Canada, which provides a mechanism for reliable regular data collection on a national scale
- Canadian Institute for Health Information (CIHI), an independent, not-for-profit organization that provides essential information on Canada's health system and the health of Canadians.
- Library Archives Canada (LAC), which has the capacity to collect, preserve and make available data specific to Canada's cultural heritage used by researchers, students, policy makers, historians, genealogists, indigenous communities, journalists, and the general public
- National Research Council (NRC), the Government of Canada's premier research and technology organization.

With respect to Statistics Canada, a strong science culture relies on the availability of national statistics with common data points; it also relies on a national data collection that is independently responsible for ensuring the integrity and privacy of the data it collects. Data and research that are collected and conducted over a long term in a standardized manner from a representative sample can be meaningfully used by researchers, government, industry, business, not-for-profits, municipalities, and communities to

inform policy, direct innovation, influence economic and social prosperity, examine socio-economic issues, and improve productivity, economy and health.

In recent years, many Statistics Canada surveys, including but not limited to the mandatory long-form Census, were cancelled; from 2006-2015, a total of 539 data products (7 Programs; 50 Surveys; 291 Tables; and 191 Publications) were terminated. The CPA has voiced its displeasure at the cancellation of many surveys, including the long-form mandatory census, University and College Academic Staff System (UCASS), the Survey of Earned Doctorates (SED), the Youth in Transition Survey (YITS) and the National Longitudinal Survey of Children and Youth (NLSCY) – to name a few.

Having access to national statistics obtained in a standardized manner from a representative sample ensures that researchers are working from a common set of data points when considering issues of common concern and will help researchers best inform public policy and direct innovation. The CPA was pleased the new Liberal federal government quickly reinstated the mandatory long-form Census upon its election to government. Sadly, there will always be a gap reflective of the years it was cancelled, which we will never be able to fill. The CPA was also pleased at the September/16 reinstatement of the UCASS. This survey, along with the SED, was cancelled after over 60 and 30 years of data collection; their cancellation left significant gaps in our ability to track the number and demographic distribution of academics in Canada, psychologists among them, as well our ability to assess how many psychologists are needed to provide adequate care of the millions of Canadians with mental health disorders. Reinstatement of the UCASS allows us to track academic positions, predict faculty age and retirement and examine the composition of faculty by salary, field, age, gender and rank. The CPA also welcomed the news that in an attempt to bridge the gap in data, Statistics Canada will also work with academic institutions to gather pertinent data from the years since 2012, as well as test the feasibility of expanding the survey to include part‑time and public college staff.

The CPA strongly supports the establishment of a system that would prevent the cancellation of these types of surveys that underpin a broad range of research without broad stakeholder consultations and support.

RECOMMENDATIONS:

1. Provide stable and predictable funds for research infrastructure to support the short and long term operational and maintenance requirements of new and existing research labs.
2. Ensure the availability of stable and rolling funds for the timely funding of smaller-scale equipment and equipment needed to pursue rapidly emerging research directions in individual laboratories.
3. Establish an unbiased, transparent, and independent, Science Office that is charged with a strong mandate and equipped with the necessary resources to oversee the use of scientific evidence in policy-making; ensure proper consultation on the future introduction and cancellation of Statistics Canada surveys; and evaluate Canada's funding of fundamental science on a regular basis.

SUPPORT FOR STUDENTS AND EARLY CAREER SCIENTISTS

Students represent the next generation of researchers, who as highly trained and skilled workers, will contribute to Canada's science culture by making ground-breaking discoveries and tackling the many economic, social, and cultural challenges facing Canadians. Historically, the thinking was that students represented our next generation of academics. As underfunding has limited the opportunities for tenure-track positions, students are often choosing to, or effectively being forced to, choose non-academic based positions.

The CPA recognizes the government does provide some support for students in the form of additional grant funding, loan repayment, and tax credits. It also recognizes the investments made by the previous government for industrial-based post-doctoral research partnerships and internships for not-for-profit organizations; however, increased investments in graduate scholarships, internships, fellowships, and cooperative placements across the natural, health, and social sciences are needed.

By way of example, continued support for internship and fellowship initiatives across a diversity of disciplines and settings, particularly those with not-for-profit organizations that do not have an economic focus, in the social sciences and humanities, and in high-demand fields, would have positive impacts on students and employers, both within Canada and internationally (e.g. closing the gap in graduation rates vis-à-vis those in peer countries; positioning Canada internationally as a solid training ground and Canadian students as highly qualified personnel). Supporting graduate-level teaching, research, and experience would also encourage Canadians to pursue graduate-level education and build a foundation for economic and social development. Real-world experience gained through internships will help them find meaningful research jobs or other high-quality employment. This would in turn boost economic growth and drive innovation; the broad impacts of which are better jobs and higher productivity. The federal government should undertake a review of its current suite of programs and delivery mechanisms to support students.

In addition to the insufficiency of funding for students and early career scientists in the form of scholarships, internships, and fellowships, researchers and students alike have also noted changes in programs that have created challenges and/or roadblocks, including but not limited to:

1. **Difficulties recruiting students to universities, particularly to smaller universities, because of limited dollars, scholarship opportunities, and available faculty positions.**

2. **In the case of NSERC specifically, reducing its funding for master's students from 2 years to 1 year.** This decision has significant effects on the ability of small universities that only offer a terminal master's program (i.e. no doctoral program) to recruit and retain students; further, master's degrees, whether in psychology or not, are rarely completed in one year. This funding strategy is out of step with program demands; reinstating the two-year funding model would easily solve this problem.

3. **Again in the case of NSERC, reducing the number of times an individual can apply for a post-doctoral fellowship from two to one.** The CPA was told that three factors contributed to the decision to reduce the number of permitted applications:
   - *the requirement to save money in times of reduced funding received from the government.* This ties to the need for more funding for the granting councils to support graduate students
   - *a reduced burden on committee reviewers.* This speaks to the need for granting agencies to obtain more reviewers, and/or develop a less burdensome review process for reviewers
   - *a success rate that was not higher on second application attempt than first attempt.* This factor is flawed as a decision-making criterion. By reducing the PDF application attempt to only once, the process becomes higher risk for the applicant. As a result, very good graduate students take a year between the end of the PhD (or extend the PhD by a year), and thus incur more student debt and delay their careers and lives, to devote to building their CV for the PDF application, for which there is no guarantee of success. For some individuals, their PhD may be their best work in which case they need a year to publish their results, while for others, their PhD work may be the stepping stone to their next best work; allowing for two application attempts covers both scenarios. In still other cases, individuals are in fact more successful on their second attempt; either because they improved their application based on feedback from the first attempt, they were being evaluated by a different review committee, and/or their pool of competition was not as strong compared to the pool in their first attempt.

4. **Challenges with harmonization of fellowship procedures.** In recent years, the funding agencies harmonized their fellowship procedures. While the prospect of harmonization was welcomed by the research community, as it provided clarity to the process, the number of fellowships a university gets is based on previous years; universities are concerned that this will limit its growth opportunities.

5. **High income scholarships that only fund a few students, as opposed to more scholarships of more moderate, but still valuable, amounts.** Moving to a model of more scholarships of more moderate amounts would support excellence, while simultaneously funding a greater number of students. In addition, based on grant data, the rate of return in terms of scientific productions is likely to be higher with a broad based funding model (Fortin & Curie, 2013).

6. **Scholarships that are not open to Canadian students or restrict students from some disciplines from applying[8].** Allowing all students to apply for a given scholarship ensures that the best possible candidate has received it.

[8] In response to a query from the CPA, CIHR amended its eligibility requirements for PhD completion to extend the window for Banting Post-Doctoral Fellowships, thereby allowing psychology doctoral graduates to apply.

7. **Lack of opportunities for research internships within industry, and within settings that do not have an economic focus (e.g. social science based internships).** The Minister of Science has been mandated to play a key role in championing science, technology, engineering and math (STEM) skills and will work with the Minister of Employment, Workforce Development and Labour to help employers create more co-op placements for students, not only for STEM but also for business programs. It is the CPA's sincere hope that the Minister of Science will not discount the contribution of scientists within the social sciences and humanities as pertains to innovation and industry; social scientists must have experience within all levels of government and non-government organizations in order to develop innovative approaches that address the full range of problems and issues that Canadian society faces.

8. **Lack of internship opportunities where students with applicable basic and applied skills can train in federal governments.** Psychology students/graduates and the Federal Government would both benefit by recruiting and training psychologists to work in Federal Departments. This could be done by creating a federal residency program to enable doctoral students in psychology to complete practical training where there is need such as in Correctional Service Canada, Department of National Defence, and Veterans Affairs Canada.

9. **Lack of funding availability (outside of university or faculty funding) for students to travel to and attend conferences where they can both present their work and network with colleagues, as well as potential graduate supervisors and/or employers.** This follows from the government's 2012 decision to eliminate SSHRC's Aid and Attendance Grants to Scholarly Associations (AAGSA) program. The CPA was one of many association negatively impacted by this decision, as it meant we could no longer provide travel subsidies to some of the 600 students that attend our annual convention each June. Reinstating and/or creating programs of this nature within all granting councils would be extremely beneficial.

RECOMMENDATIONS:

1. Increasing funding for scholarships, provide a greater number of moderate scholarships to more students, and in the case of NSERC, provide funding for two years of masters training
2. Increase funding for internships, streamline the funding process, and provide internship opportunities in federal departments, within industry, and within settings that do not have an economic focus
3. Increase funding for fellowships, and restore (in the case of NSERC) the number of times one can apply to two.
4. Restore funding for students to travel to and attend conferences

DISSEMINATING RESEARCH KNOWLEDGE

The previous pages of this submission have addressed issues related to the funding of researchers, the funding of research equipment and facilities, and funding for our next generation of researchers. The following pages will speak to issues affecting researchers and their abilities to disseminate their research findings, specifically as pertains to open access, open data, and knowledge mobilization.

Open Access

Open access has become a dominant reality, in Canada and abroad, and is specifically encouraged by Canada's granting councils. The advantages and value of making research accessible, especially to individuals and institutions in poorer countries, are well known; individuals and institutions in poorer countries or who do not or cannot belong to an organization or a university with a subscription have access to research findings. However, there are distinct disadvantages to both individual researchers, particularly students and early career scientists, and to journal publishers.

Open access journals are relatively easy to develop, with new ones popping up in an individual's mailbox almost weekly. Some are formed by reputable organizations with recognized scholars serving as editors; others are less reputable, and without credible peer-review processes. While a full discussion of some of the challenges related to open access is beyond the scope of this paper, there are a few issues of relevance as pertains to the dissemination of scientific findings.

With less reputable open access journals, publications standards are being eroded, particularly as pertains to the peer review process (e.g., ability to find high quality reviewers) and the quality of submissions. Some researchers have noted little oversight for the production of an open access journal, with editors offering little to guide the revision process. It is imperative that a system/process be developed to guide strong publication and editorial standards within open access journals.

One cannot discuss open access without discussing the publication costs for researchers and publishers. From a grant holder's perspective, although one can budget for open access publication fees within a grant, granting agency budgets have not increased; as a result, open access publication costs have to be taken out of funds that could have gone towards support for a graduate student and/or direct costs. From the perspective of the CPA, as publisher of three peer-reviewed journals, what is the business model to support open access? The publisher's costs are considerable, even in the absence of print. In the case of psychology, and likely many other disciplines, if authors have to pay to publish, they will likely be even more inclined to direct their best work elsewhere – like American journals with broader readerships and larger impact factors.

It is recognized that "open access" does not necessarily mean "open access journals"; "regular" journals will allow and/or publish a certain number of manuscripts in an issue, albeit at an exorbitant fee. It is also recognized that funding agencies will permit a pre-publication version of a manuscript being deposited in a repository or posted on a webpage in lieu of open access publishing; however, this has significant impacts on publishers who rely on e-royalties obtained from the downloads of their published manuscripts to cover their production costs.

Researchers are also effected by their decision to publish or not publish in open access journals. Given the choice, researchers want to publish in journals with high/historical levels of credibility and impact factors; however, this is often not considered by adjudication committees when reviewing grants which are focussed on evaluating an applicant's number of open access publications.

Open Data

The quality and breadth of the research that is pursued in academic settings is one of the most important determinants of effective academic/private sector knowledge transfer; it is the CPA's understanding that the funding agencies are moving towards a model of open data, that would make data available for secondary analyses by individuals other than the researchers who initially received funding to conduct the research.

Akin to open access, open data is something for which there are advantages and disadvantages. While one can argue that research conducted with public funds should be made available for secondary analyses, one could also argue that some research is collected with conditions that do not allow for secondary analysis. For example, the uses to which the data will be put must be disclosed to participants and, for some kinds of psychological research projects, there is an explicit agreement that the sensitive data shared will only be used for one and/or a specific purpose. Some research data require a specific skill set and/or equipment to use; again, as is the case in some psychological research which is reliant on specific equipment to assess eye activity, brain function, etc. Qualitative and quantitative data are not one and the same, and thus require different open data strategies. One could also query why a researcher has claim to data for which they did not apply and have to show their merit to collect. Moreover, there may be intellectual property associated with some data (e.g., software developed; new tests developed and validated) that the researchers (and one's institution) ought not to be required to give away.

Our capacity for open data, particularly for long-term access and re-use of data must be significantly improved before Canada's universities and their libraries can work collaboratively to steward the intellectual output of universities.

Knowledge Mobilization

Most scientists would agree that, although knowledge mobilization is a worthy goal, it might not be appropriate for all studies, either because of the nature of the research or because some research findings are too preliminary or not sufficiently replicated to be disseminated or generalizable to the public; further, connecting with those who have the expertise and the networks required to translate basic research into accessible language and distribute it widely is difficult and often-times time-consuming. As such, one needs to balance the value of knowledge mobilization with fundamental research very carefully.

As with open access publications and open data, there are pros and cons to knowledge mobilization. Knowledge mobilization and by extension, program evaluation, are necessary, as good social policy and programming is informed by evidence; further, with public funds, comes a level of accountability to

funders and the public. However, there are many different ways to mobilize knowledge that require different skill sets, time commitments, and financial resources on the part of researchers.

Increasingly, knowledge mobilization is becoming a requirement of grant applications within the social and health sciences; less so in the natural sciences which still, whether erroneously or not, consider publications and presentations as core knowledge mobilization. One could argue that knowledge mobilization should never be an evaluation criterion of basic research; one never knows if a study is going to be effective, and/or generate results that are appropriate for standard knowledge mobilization plans.

In terms of capacity, some researchers may be more skilled in developing, conducting and evaluating knowledge mobilization plans than others and may not have the resources to access knowledge mobilization expertise. This is also true for institutions; smaller universities may be at a disadvantage compared to larger universities that can devote staff and/or resources to helping applicants develop knowledge mobilization plans - in this case, one could argue the individual researcher is not being evaluated but rather that the capacity of one's institution is. Many of today's researchers do not feel they have the skill set, time capacity, or financial resources to become web designers/content-managers, social media experts, video editors, etc. that seems to be necessary to actively promote research. Professional associations are increasingly being contacted by individual researchers or research teams to serve as a KM partner on grant applications; while this is a reasonable request to make of one's professional association, it is also expected that the association's contribution will be an in-kind contribution, thereby taxing an association that is already often under-staffed and over-worked.

There are ways for the federal government, via the tri-council funding agencies, and the provincial government, via its oversight for education, to increase knowledge mobilization. These include but are not limited to:

- providing a funding mechanism for national professional associations to partner with researchers at the grant proposal stage to formulate and implement plans for enhancing the economic, social, and technological impact of the research
- integrating knowledge mobilization into graduation programs/curricula either as its own course or as part of existing courses
- training those who teach graduate classes about the importance of knowledge mobilization
- ensuring that each department (ideally) or at least each university has a knowledge mobilization expert that can assist researchers across all disciplines and types of research
- establishing a funded non-government organization to support research and researchers, across disciplines, in developing, implementing, and evaluating knowledge mobilization strategies
- identifying and creating incentives for researchers that extend beyond peer-reviewed journals to actively engage in knowledge mobilization
- establish the relevance and significance of research in the natural, social sciences, and health sciences in a way that extends beyond publications

- establish funding envelopes solely for knowledge mobilization and evaluation, and ensuring there is sufficient expertise on adjudication committees to properly evaluate a grant application's knowledge mobilization plan

RECOMMENDATIONS:

- Carefully consider the merits of open access publications on researchers, peer review systems, and publishers
- Carefully consider the merits of open data initiatives, ensuring that the tri-councils undertake proper consultation with researchers across numerous disciplines before imposing a plan and process that is significantly flawed and either renders publicly funded data useless or which violates the ethical standards under which the data was initially collected.
- Carefully consider the different ways that knowledge can be mobilized, how its impact can be assessed, and how it needs to be directly funded as not all knowledge mobilization can be an "in-kind" line item. Where appropriate, researchers and institutions need to be better trained and supported in knowledge mobilization. Funders need to ensure the availability of distinct funds for knowledge mobilization, that are separate from basic research operating grant applications or not required as part of them. Funders also need to ensure the availability of reviewers with expertise in evaluating knowledge mobilization and evaluation plans.

CONCLUSION

Science – social, natural and health – is a fundamental part of Canada's history and future, having relevance to societal well-being, human functioning, health, technology, innovation, productivity and the economy; its relevance can be measured at the individual, business, and community levels.

According to the Council of Canadian Academies, "a society has a strong science culture when it embraces discovery and supports the use of scientific knowledge and methodology. Such a culture encourages the education and training of a highly skilled workforce and the development of an innovative knowledge-based economy."[9] Investments in a science culture will contribute to more and better-paying jobs, new inventions and patents, increased productivity, increased government revenues over the medium- to long-term and an increased standard of living for Canadians – all of which will contribute to helping Canada's people, businesses, and urban/rural/remote communities. Such investments will also help to secure Canada's place as an international destination that supports a science culture for the public, evidence-based policy, and current and future researchers.

Need for a Science Policy Agenda

In addition to the numerous issues highlighted in the previous pages, an additional issue affecting science and innovation in Canada is the lack of a national science policy agenda that cross-cuts the natural, social and health sciences in a manner that allows for science to be conducted in a systematic, public and replicable manner; allows researchers the freedom to direct their own scientific inquiry as well as respond to the concerns and queries that society and public policy pose; requires rigorous peer review processes; and includes a scientific advisory body structure that is unbiased and transparent in its decision-making.

Canada currently does not provide adequate support to be able to boast a strong and vigorous science culture. There are deficiencies in the form of grants for operating funds; funding for indirect costs for research infrastructure and operating costs; funding for small and large scale equipment; and scholarships, fellowships, internships, and cooperative placements for students and post-docs. Further, the absence of a science agenda has contributed to a variety of challenges, including but not limited to:

- vulnerabilities in Canada's national data infrastructure;
- significant decreases in absolute research funding for basic research in Canada;
- inequities in the distribution of funds to the granting councils;
- inadequately explained fundamental shifts in the nature of research funded by a given agency;
- lack of transparency among some agencies with respect to their application and decision-making processes;
- inadequacies in how research is reviewed; and

9 http://www.scienceadvice.ca/uploads/eng/assessments%20and%20publications%20and%20news%20releases/SandT_II/StateofST2012_fullreportEN.pdf

- arbitrary and unjustifiable decisions concerning the types of research funded.

A national science policy would provide guidance that should prevent adverse decisions and policies such as those illustrated throughout this paper.

CPA Reflections

In closing, current curricula in psychology provide excellent training in scientific methodology and research design, data collection and analysis, critical thinking and theoretical grounding, professional writing, knowledge translation, and evaluation. Psychological research has broad and deep relevance to the success of individuals, families, economies and societies with an application to public policies and programs, economic recovery and assuring Canada's long-term prosperity. Psychological research yields measurable and concrete benefits in the workplace (e.g., how to sustain productive and successful workforces), individual and societal well-being (e.g., how to create policies and programs that enhance childhood development, family functioning or healthy aging), and health (e.g., how best to prevent and treat mental health problems and disorders) – to name only a very few.

Unfortunately, despite this vast contribution, the current funding system does not serve psychology as well as it could. Psychology could benefit from: an integrated funding agency or funding envelopes and mandates that promote collaboration and interdisciplinary investigations; a more streamlined system to which to apply for operating and equipment grants; equipment grants of varying sizes and with rolling deadlines; peer review processes that include face-to-face deliberations; ongoing consultation with the research community on the design of funding programs; open grants that do not unduly constrain creativity; grants specific to knowledge mobilization and program evaluation; a sustainable funding system that supports academics of varying seniority, women, post-docs and early career scientists, and students; a more streamlined approach for oversight and funding of internships, scholarships, fellowships, and co-op placements; careful consideration of the merits of open access publications and open data initiatives; and a funding approach that supports a broad range of projects and approaches.

It is critical to develop, promote and support a culture that values discovery and innovation in all sciences – including but not limited to natural science, technology, engineering, social science and humanities, health, and math – to foster an interest in Canada's youth, women, and underrepresented segments of society, achieve and benefit from the vast impacts of scientific inquiry, and secure Canada's identity as an international destination attracting scholars. As the members of this panel undoubtedly know, achieving this will require modifications to existing funding mechanisms, investments in direct research and equipment/facilities, support for students, and an overarching science agenda for Canada. The CPA looks forward to the recommendations of the panel, and ultimately seeing the implementation of many changes that will improve the way in which basic research is supported in Canada.

The CPA thanks the Minister of Science for conducting this review, and for the opportunity to submit its input to the panel overseeing Canada's Fundamental Science Review. We are happy to consult and/or provide further information as necessary (613-237-2144 ext. 323 or executiveoffice@cpa.ca)

Appendices

Appendix A. Fulfilling the CPA's Mandate

The CPA fulfills its mandate through numerous activities including but not limited to:

- **hosting an annual scientific convention:**
- **hosting meetings and summits on topical issues (e.g. need, supply and demand; knowledge mobilization);**
- **publishing three peer-reviewed journals, a quarterly magazine, a monthly electronic newsletter, and numerous online documents, all of which are key products for disseminating information about psychological science;**
- accrediting doctoral programs and internships across the country;
- assisting the discipline and profession through guidance, standards and documents relevant to research, teaching, and practice;
- contributing to public policy through positions, statements, and presentations on topical issues about which psychology has expertise;
- representing the discipline and profession through its participation in various alliances, committees, and partnerships with external stakeholders; and
- **advocating with government, funding agencies, and universities – to name a few – on behalf of the discipline and profession through meetings with MPs and funders, responding to MP requests for information, launching strategic communications and media campaigns, making submissions to government, participating in the budgetary process, participating in government and funder consultations, and presenting at Standing Committees.**

Appendix B. Examples of Psychological Research Topics

The core dimensions of fundamental psychological research are the domains of cognitive science, behavioural and health science, and social science. In turn, these fields have worked closely with neurosciences and one can point with satisfaction to Canadian specialization in cognitive neuroscience, affective neuroscience, behavioural neuroscience and social neuroscience; these domains are often specializations within the discipline of psychology.

Canadian research on the following topics, among others, has benefited from fundamental scientific scholarship in these fields, leading to advances in understanding and improved health and productivity of Canadians:

- Mental health problems (e.g., depression, anxiety, phobias)
- Neurological, genetic, psychological, and social determinants of behaviour;
- Psychological determinants of health and psychological factors that contribute to health and disease management;
- Role of psychological factors in preventing disease and maintaining physical health;
- Rehabilitation and adjustment to disability and chronic illness;
- Brain injury, degenerative brain diseases;
- Perception and management of pain in infants, children, adults and older persons;
- Relationship between psychological factors and physical illness (e.g., diabetes, heart disease, stroke);
- Management of psychological aspects of terminal illnesses and end-of-life care;
- Cognitive functions (e.g., learning, memory, problem solving, intellectual ability);
- Developmental and behavioural abilities and problems across the lifespan;
- Developmental disorders in children (e.g., autism, conduct disorders, suicidal risk);
- Criminal behaviour, crime prevention, and services for victims and perpetrators of crime;
- Addictions and substance use and abuse (e.g., smoking, alcohol, opioids, prescription/recreational drugs);
- Stress, anger, and other aspects of lifestyle management;
- Court consultations on the role of psychological factors in legal matters (e.g., accidents and injury, parental capacity, competence to manage one's personal affairs);
- Psychology in the workplace (e.g., motivation, leadership, productivity, marketing, healthy workplaces, ergonomics, mental health);
- Marital and family relationships and problems;
- Social and cultural behaviours and attitudes;
- The relationship between individuals and the groups to which they belong (e.g., work, family, society); and
- Psychological factors related to performance at work, school, recreation, and sport.

Appendix C. CPA Advocacy with NSERC on Behalf of Psychology Students

As part of its mandate, the CPA regularly liaises with the funding councils on matters that have an impact on funding for psychological research. To illustrate, an issue specific to NSERC scholarship/fellowship funding was brought to the CPA's attention in 2009. The tri-councils had undertaken a strategic review of their mandates, re-structured their funding criteria and identified areas where operations could be streamlined to be made more efficient. One outcome of concern to psychology was NSERC's decision to explicitly state that it would not fund students in programs in clinical psychology, even when the student's research fell within the NSERC mandate; this decision was predicated on the erroneous belief that all psychology students pursue a clinical/health-research path not consistent with research in the natural sciences, despite the long-term commitment of NSERC to support fundamental research in psychological processes. In response to advocacy from the CPA and various individual CPA members who were able to explain the various career trajectories of psychology students, NSERC revised its decision. In consequence, all students registered, or intending to register, in a clinically-oriented program would be eligible for NSERC funding if: 1) they proposed a research project deemed eligible to be funded by NSERC; AND 2) they were supervised by a researcher holding an active NSERC Discovery Grant. Please note that a scientist-practitioner training model is the normative standard in professional psychology in Canada.

In the years following this revised decision, the CPA has collected data on the implications of these criteria. in an effort to advocate for the removal of the second requirement. The CPA was pleased to announce the effectiveness of these advocacy efforts: on April 10, 2015, NSERC informed the CPA that it had revisited the rules for scholarship applicants who were enrolled in, or had the intention to enroll in, clinically-oriented psychology programs (e.g., clinical psychology or clinical neuropsychology) and would be changing its eligibility rules for this category of applicant. As of Competition 2016 (i.e., for applications submitted to NSERC in fall 2015), the proposed supervisor for these applicants would no longer need to hold an active NSERC Discovery Grant. To be declared eligible, and as is the norm, applicants must continue to propose research that is deemed eligible to be funded by NSERC. In removing this requirement, NSERC made this process consistent with the Discovery Grant Application process itself in which research is judged on the merit of its intention and not the program in which a faculty member is registered. Consultation with the relevant scientific community may have prevented this decision from having been made in the first place, or at least have provided NSERC with the correct information with which to make its decision.