PEER REVIEW HISTORY

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ARTICLE DETAILS

<table>
<thead>
<tr>
<th>TITLE (PROVISIONAL)</th>
<th>The impact of a streamlined funding application process on application time: two cross-sectional surveys of Australian researchers</th>
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<tbody>
<tr>
<td>AUTHORS</td>
<td>Barnett, Adrian; Graves, Nicholas; Clarke, Philip; Herbert, Danielle</td>
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</tbody>
</table>

VERSION 1 - REVIEW

| REVIEWER           | David Kaplan  
|                   | Case Western Reserve University  
|                   | USA  |
| REVIEW RETURNED    | 12-Nov-2014 |

| GENERAL COMMENTS   | This study is interesting and important. It suggests that some policies may have effects opposite to their stated intentions. Additionally, it represents an attempt to understand funding mechanisms which is essential in efforts to improve policy goals. |
|                   | The most important deficiency in the manuscript is the paucity of data. The manuscript describes a comparison of 2 studies. The studies are not definitive because more than 1 parameter changed between the 2 studies. This attribute depreciates the conclusions possible. |
|                   | Specific comments follow: |
|                   | The actual statistical values obtained are not clear. Several questions are raised. |
|                   | Were the applications that are resubmissions treated separately from the applications that are new submissions? |
|                   | What is the average number of applicants per application? |
|                   | Are the primary applicants (principal investigators) treated separately from the secondary applicants (co-investigators) in the analysis? |
|                   | Did the survey ask for time spent as days or as hours? |
|                   | On page 8, lines 29 to 42, the authors present a statement but it is not compelling. The authors pose a hypothetical situation, “If researchers spend a fixed amount of time on applications”, which their own data indicates is not pertinent. The statement itself is enigmatic. Spending less time on the “other parts” of the application does not explicate the finding of the study that more time was spent on the application process. |
|                   | The speculation on page 9 that competition may have changed in the time period of the study and the increased competition may have prompted the increased time spent on the applications serves to
undercut the impact of this study. Additionally, the 2 mechanisms that the authors suggested for reducing competition are certainly not exhaustive. Why the third mechanism proffered, a lottery, is not included in the list of mechanisms of reducing competition is not clear. Even with this third mechanism, there are others that are not considered.

On page 10 the authors suggest that anonymity is a graded quality ("... to make the survey more anonymous ... "). Perhaps it is enough to make the survey anonymous.

REVIEWER
Stephen A Gallo
American Institute of Biological Sciences; USA

REVIEW RETURNED 14-Nov-2014

GENERAL COMMENTS
The authors describe a cross-sectional study of applicant survey data regarding application submission time both before and after a streamlining process was implemented, reducing the required number of pages. This is a straightforward analysis employing a bootstrap method to convert data from individual researchers to data concerning individual applications (with multiple researchers). One of the main outputs was estimated time per application, which actually increased in the case of the streamlined process.

The authors appropriately conclude that while it did not look as if the streamlined process was effective in reducing the time to write an application, several factors could be at work. Most notably, the scientific plan section was not one of the areas streamlined, and it is likely this is where much of the effort goes. In fact the authors state that many applicants indicated that they spent more time on the science of the application. While more streamlining may be needed in this section, there may be a trade-off between shorter research plans and application quality (although this remains to be tested). Also, increased competition was listed as a potential factor effecting preparation time, however the authors also concede that over competition would likely lead to reduced application quality (as evidenced by the simulation study the authors reference). Perhaps including a measure of application quality (e.g. average application score or perhaps surveying the reviewers on the overall quality of these applications) may have been an interesting variable to have been included. It may be that as preparation time increased, so did application quality (possibly due to more focus on research design) which would be a beneficial outcome of the streamlining process. However, this data may not be available to the authors.

One minor point, it was unclear what the average application preparation time of resubmissions was compared to first-time submissions. In both cases, resubmissions represent over a third of submissions, and it was unclear if some of the 2014 group had original submissions from before the institution of the streamlined process. If so, it may be that converting their original submission from the old format to a resubmission in the new format may in fact be more complicated than just submitting a first-time submission in the new system, thus bumping up the average preparation time. The breakdown of preparation time for resubmissions versus first-time submissions should be included in the manuscript. This is the reason for the request for minor revision and the reason the "Are the discussion and conclusions justified by the results" question was
marked as No. The rest of the manuscript was straightforward in its design, well explained, and justified in its conclusions. Most of the study limitations were discussed.

REVIEWER
Mikael Fogelholm
University of Helsinki, Finland
REVIEW RETURNED
25-Nov-2014

GENERAL COMMENTS
This study shows that streamlining grant proposal requirements (e.g. making the proposal shorter) did not reduce the time spent on proposals. This is in general an interesting question for all research funding organizations. The specific results of this study are obviously important for the Australian MRC, who may decide on further actions to make the process more rapid. However, the applicability beyond this context is my main concern. I am afraid that without knowing why the changes did not have an anticipated effect on the consumption of time, the general interest of this study is limited. I would have liked to see, e.g., that these results are combined with a qualitative approach, like focus-group interviews.

VERSION 1 – AUTHOR RESPONSE
Reviewer Name David Kaplan
Institution and Country Case Western Reserve University
USA
This study is interesting and important. It suggests that some policies may have effects opposite to their stated intentions. Additionally, it represents an attempt to understand funding mechanisms which is essential in efforts to improve policy goals.
The most important deficiency in the manuscript is the paucity of data. The manuscript describes a comparison of 2 studies. The studies are not definitive because more than 1 parameter changed between the 2 studies. This attribute depreciates the conclusions possible.
Response: Although some things changed between the two surveys, the key question on time spent remained the same. We have added two new graphs to further describe the differences in times.
The actual statistical values obtained are not clear. Several questions are raised.
Were the applications that are resubmissions treated separately from the applications that are new submissions?
Response: Yes, as the time spent on first applications and resubmissions was generally very different we made a distinction between the two. We have added Table 2 that gives summary statistics on the time spent by resubmission status and survey.
What is the average number of applicants per application?
Response: Using 2013 data from the NHMRC, the median number of applicants per application was 3, with an inter-quartile range from 2 to 4; the average was 3.3. In the paper we show the summary statistics on the mean number of applications per researcher (we have clarified this on page 7).
Are the primary applicants (principal investigators) treated separately from the secondary applicants (co-investigators) in the analysis?
Response: Yes, as we attempted to explain in Figure 1, the time spent per application is summed over all applicants and these applicants are sampled depending on their position. We have now highlighted the differences in time by researcher position using a boxplot (Figure 3).
Did the survey ask for time spent as days or as hours?
Response: in working days of 7.5 hours (page 5).

On page 8, lines 29 to 42, the authors present a statement but it is not compelling. The authors pose a hypothetical situation, “If researchers spend a fixed amount of time on applications”, which their own...
data indicates is not pertinent. The statement itself is enigmatic. Spending less time on the “other parts” of the application does not explicate the finding of the study that more time was spent on the application process.

Response: We agree that this hypothesis is not supported by the data. But it is a potential explanation for our findings that makes economic sense. The extra time in this round could be due to the extra time spent on formatting changes, such as changes to the track record (discussed on page 10).

The speculation on page 9 that competition may have changed in the time period of the study and the increased competition may have prompted the increased time spent on the applications serves to undercut the impact of this study. Additionally, the 2 mechanisms that the authors suggested for reducing competition are certainly not exhaustive. Why the third mechanism proffered, a lottery, is not included in the list of mechanisms of reducing competition is not clear. Even with this third mechanism, there are others that are not considered.

Response: Any intervention to reduce competition must in some way either increase the funding pool or reduce application numbers. The lottery is not an intervention for reducing competition, rather it is a potential approach for saving time (we have now clarified this; page 10).

On page 10 the authors suggest that the lottery may have changed in the time period of the study and the increased competition may have prompted the increased time spent on the applications serves to undercut the impact of this study. Additionally, the 2 mechanisms that the authors suggested for reducing competition are certainly not exhaustive. Why the third mechanism proffered, a lottery, is not included in the list of mechanisms of reducing competition is not clear. Even with this third mechanism, there are others that are not considered.

Response: We agree that this hypothesis is not supported by the data. But it is a potential explanation for our findings that makes economic sense. The extra time in this round could be due to the extra time spent on formatting changes, such as changes to the track record (discussed on page 10).

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On page 10 the authors suggest that anonymity is a graded quality (“… to make the survey more anonymous …”). Perhaps it is enough to make the survey anonymous.

Response: We have removed the word “more”.

Reviewer Name Stephen A Gallo
Institution and Country American Institute of Biological Sciences; USA

The authors describe a cross-sectional study of applicant survey data regarding application submission time both before and after a streamlining process was implemented, reducing the required number of pages. This is a straightforward analysis employing a bootstrap method to convert data from individual researchers to data concerning individual applications (with multiple researchers). One of the main outputs was estimated time per application, which actually increased in the case of the streamlined process.

The authors appropriately conclude that while it did not look as if the streamlined process was effective in reducing the time to write an application, several factors could be at work. Most notably, the scientific plan section was not one of the areas streamlined, and it is likely this is where much of the effort goes. In fact the authors state that many applicants indicated that they spent more time on the science of the application. While more streamlining may be needed in this section, there may be a trade-off between shorter research plans and application quality (although this remains to be tested). Also, increased competition was listed as a potential factor effecting preparation time, however the authors also concede that over competition would likely lead to reduced application quality (as evidenced by the simulation study the authors reference). Perhaps including a measure of application quality (e.g. average application score or perhaps surveying the reviewers on the overall quality of these applications) may have been an interesting variable to have been included. It may be that as preparation time increased, so did application quality (possibly due to more focus on research design) which would be a beneficial outcome of the streamlining process. However, this data may not be available to the authors.

Response: We agree that a shorter application process with more time spent on the interesting science could increase application quality. Our previous analysis found no association between time spent on the application and the probability of winning funding, which indicates that time and quality are not associated (BMJ Open 2013;3:e002800). However, what’s really needed to answer this question is the creation of a number of gold standard applications that can be reliably ranked. These grants are then reduced in size, sent to reviewers for ranking, from which the reliability of the reduced versions can be checked. A number of different sized reductions could be tried, from 10% to 50% or more.

One minor point, it was unclear what the average application preparation time of resubmissions was compared to first-time submissions. In both cases, resubmissions represent over a third of submissions, and it was unclear if some of the 2014 group had original submissions from before the
institution of the streamlined process. If so, it may be that converting their original submission from the old format to a resubmission in the new format may in fact be more complicated than just submitting a first-time submission in the new system, thus bumping up the average preparation time. The breakdown of preparation time for resubmissions versus first-time submissions should be included in the manuscript. This is the reason for the request for minor revision and the reason the “Are the discussion and conclusions justified by the results” question was marked as No. The rest of the manuscript was straightforward in its design, well explained, and justified in its conclusions. Most of the study limitations were discussed.

Response: We have added Table 2 that gives summary statistics by resubmission, researcher position and round (before/after streamlining). Resubmissions generally took less time, as we would expect. There was an increase in the average time of first-time submissions after streamlining, suggesting that the increase was not just about converting prior submissions to the new format.

Reviewer Name: Mikael Fogelholm
Institution and Country: University of Helsinki, Finland

This study shows that streamlining grant proposal requirements (e.g. making the proposal shorter) did not reduce the time spent on proposals. This is in general an interesting question for all research funding organizations. The specific results of this study are obviously important for the Australian MRC, who may decide on further actions to make the process more rapid. However, the applicability beyond this context is my main concern. I am afraid that without knowing why the changes did not have an anticipated effect on the consumption of time, the general interest of this study is limited. I would have liked to see, e.g., that these results are combined with a qualitative approach, like focus-group interviews.

Response: We know that other countries are suffering the same problem. An investigation of international funding agencies found that 11 out of 29 agencies who responded to a survey said that the administrative burden was worse than 5 years ago, and 12 said there were too many applications in the system (Schroter et al. BMC Medicine 2010, 8:62). We also like this quote from a recent Nature Medicine news article, “These days we do nothing but write grants.” (Beverly Ginsburg-Cooper, senior vice president for research at Dana Farber Cancer Institute, Boston; Nature Medicine vol 15, page 467).

We have added a paragraph to the conclusion on this issue. We also think that international funding agencies could learn from the Australian experience.

VERSION 2 – REVIEW

<table>
<thead>
<tr>
<th>REVIEWER</th>
<th>David Kaplan</th>
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<tr>
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<td>Case Western Reserve University</td>
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<td>USA</td>
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<tr>
<td>REVIEW RETURNED</td>
<td>15-Dec-2014</td>
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| GENERAL COMMENTS  | This study is interesting and important. It suggests that some policies may have effects opposite to their stated intentions. Additionally, it represents an attempt to understand funding mechanisms which is essential in efforts to improve policy goals. Nevertheless, there are concerns as follows:

1. The accuracy of self-reported time spent on a grant submission is not certain. This issue is especially important because the investigators were asked to make this estimate after they had submitted the application. The time from submission to survey is not specified in the manuscript.

2. The inclusion of applications that were resubmissions along with
initial submissions may serve to confound the analysis unless the results were stratified on this characteristic.

3. The average number of applications per research was 2.2 in 2014 but 3.1 in 2012. Thus, the increased amount of time spent in 2014 compared to 2012 may be due to the decreased number of applications submitted in 2014 compared to 2012. There was a 29% decrease in the number of applications per investigator submitted and an 11% increase in the amount of time spent per application.

4. The data include lead researcher as well as secondary researchers. However, it is unclear whether all researchers per application were surveyed. Preparation per application would require assessing the time spent by all the applicants.

5. Lines 53 to 57 of page 7 include a comparison of “overall time spent” in terms of working years. Since there were different numbers of applications assessed before and after streamlining, this statistic is confusing.

6. Figure 3 shows that the lead researcher spent the same amount of time before and after streamlining. It seems that the increase in time spent in preparing the application after streamlining was accounted for by the secondary researchers involved but not by the primary researchers.

7. The first paragraph of the Discussion indicates that application time may be a function of potential financial return or the competitiveness of the process. It seems reasonable to include the possibility that the increased participation of secondary researchers may also account for the added time in preparation. Also, the success rate is not known when the researchers are preparing the applications. Consequently, the possibility that potential financial return or competitiveness explain the additional time spent after streamlining does not seem to be a particularly cogent explanation.

8. The suggestion on page 9 that researchers spend a fixed amount of time on applications does not seem compelling. The amount of time spent on an application is likely to be a function of many factors. The support of this notion from an anecdotal comment is not especially convincing.

REVIEWER                Stephen A Gallo  
                          American Institute of Biological Sciences - USA  
                            
REVIEW RETURNED          08-Dec-2014  
                            
GENERAL COMMENTS         As it is noted in the text and in Table 2, resubmissions show a decrease in lead PI application preparation time as a result of the streamlining process, while first time submissions increase in lead PI application preparation time as a result of the streamlining process. This seems to be an important point that is not addressed in the discussion.

For one thing, if one assumes resubmissions are under the same increase in competitiveness as first time submissions, one would assume the preparation time would go up for both, but that is not the case. Is it possible that resubmissions have a higher success rate, and therefore have less competitive pressure? Alternatively, if
### VERSION 2 – AUTHOR RESPONSE

**Reviewer Name Stephen A Gallo**

As it is noted in the text and in Table 2, resubmissions show a decrease in lead PI application preparation time as a result of the streamlining process, while first time submissions increase in lead PI application preparation time as a result of the streamlining process. This seems to be an important point that is not addressed in the discussion.

**Response:** To help interpret the figures further we have added an estimate of the mean difference and 95% confidence interval to Table 2. To our eyes the major finding seems to be that the times were similar (Figure 2) with small increases for non-lead researchers (Figure 3). These small increases when multiplied by the large number of applications mean a relatively large increase in the overall time.

For one thing, if one assumes resubmissions are under the same increase in competitiveness as first time submissions, one would assume the preparation time would go up for both, but that is not the case. Is it possible that resubmissions have a higher success rate, and therefore have less competitive pressure? Alternatively, if competition is increasing equally for both resubmitted and first-time submissions, perhaps the optimization of the creative/innovation process takes much more energy/time for PIs of first time submissions than resubmitting PIs, who largely are addressing the methodological concerns of the previous reviewers.

**Response:** Our previous research found that resubmissions actually had a reduced chance of success (BMJ Open, 2013;3:e002800), so they are likely to face a higher competitive pressure (although most researchers are probably unaware of this finding).

It is plausible that the effect of competition would vary according to new or resubmissions as the reviewer suggests. However, unsuccessful applicants for NHMRC Project Grants get little to no feedback on why they were unsuccessful, so they are rarely able to address methodological concerns.

Also, if it is assumed that lead PIs (those who contribute most to preparation time) allocate fixed amounts of time for grant applications, why do first time submission preparation times increase after streamlining while resubmissions decrease?

**Response:** The increase was relatively small and the confidence intervals for both changes include 0 (Table 2). The similar times (and relatively narrow confidence intervals) are consistent with the hypothesis of researchers allocating a fixed amount of time.

The inconsistency of the effect of streamlining on preparation time between first-time and resubmitting applications needs to be addressed in the discussion section.

**Response:** We prefer to focus on bigger issues in the discussion, and we think that these relatively small differences do not need further discussion.

**Reviewer Name David Kaplan**

This study is interesting and important. It suggests that some policies may have effects opposite to
their stated intentions. Additionally, it represents an attempt to understand funding mechanisms which
is essential in efforts to improve policy goals.

Nevertheless, there are concerns as follows:

1. The accuracy of self-reported time spent on a grant submission is not certain. This issue is
especially important because the investigators were asked to make this estimate after they had
submitted the application. The time from submission to survey is not specified in the manuscript.

   Response: We sent out our survey straight after the round closed, and have now included this in the
text on page 4. We have also added a paragraph to the limitation section of the discussion on our
retrospective data collection.

2. The inclusion of applications that were resubmissions along with initial submissions may serve to
confound the analysis unless the results were stratified on this characteristic.

   Response: The proportion of resubmissions was constant for the estimated times in before and after
streamlining (page 6), hence it is not possible for resubmissions to be a confounder.

3. The average number of applications per research was 2.2 in 2014 but 3.1 in 2012. Thus, the
increased amount of time spent in 2014 compared to 2012 may be due to the decreased number of
applications submitted in 2014 compared to 2012. There was a 29% decrease in the number of
applications per investigator submitted and an 11% increase in the amount of time spent per
application.

   Response: The number of applications actually increased in 2014; there was a mistake in the text
which we have now fixed. To examine this issue we have investigated the association between
application numbers and average time spent using our data. For each extra application per
researcher the average time spent per application decreased by 2.5 days (95% confidence interval –
0.9 to 4.1 days). This makes sense as if researchers are submitting more applications they have less
time for each application.

4. The data include lead researcher as well as secondary researchers. However, it is unclear whether
all researchers per application were surveyed. Preparation per application would require assessing
the time spent by all the applicants.

   Response: Yes, all researchers were surveyed regardless of their position and the estimated overall
time includes all researchers as described in the text (page 5) and Figure 1.

5. Lines 53 to 57 of page 7 include a comparison of “overall time spent” in terms of
working years.

   Since there were different numbers of applications assessed before and after streamlining, this
statistic is confusing.

   Response: We fixed the number of applications before and after streamlining to avoid this issue (page
6).

6. Figure 3 shows that the lead researcher spent the same amount of time before and after
streamlining. It seems that the increase in time spent in preparing the application after streamlining
was accounted for by the secondary researchers involved but not by the primary researchers.

   Response: We agree and discuss a possible reason on page 11.

7. The first paragraph of the Discussion indicates that application time may be a function of potential
financial return or the competitiveness of the process. It seems reasonable to include the possibility
that the increased participation of secondary researchers may also account for the added time in
preparation. Also, the success rate is not known when the researchers are preparing the applications.
Consequently, the possibility that potential financial return or competitiveness explain the additional
time spent after streamlining does not seem to be a particularly cogent explanation.

   Response: Researchers are well aware of the historical trend in success rates, which since 2010
have been steadily downwards (page 9). It would be reasonable of researchers to assume that this
trend in competition will continue.

8. The suggestion on page 9 that researchers spend a fixed amount of time on applications does not
seem compelling. The amount of time spent on an application is likely to be a function of many
factors. The support of this notion from an anecdotal comment is not especially convincing.

   Response: We agree that the evidence for this statement is not yet compelling, but it has been put
forward by many researchers including members of the NHMRC Research Council. We feel it is a
hypothesis with some value and we should be prepared to be surprised, as results in this field have often been surprising.
The impact of a streamlined funding application process on application time: two cross-sectional surveys of Australian researchers
Adrian G Barnett, Nicholas Graves, Philip Clarke and Danielle Herbert

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