Author's response to reviews

Title: Are behavioural interventions effective in increasing physical activity at 12-36 months in adults aged 55 to 70 years? A systematic review and meta-analysis

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Author's response to reviews: see over
Dear Editor Barnard,

Thank you for email dated 25th January 2013 inviting us to respond to the two reviewers’ comments and resubmit a revised version of our manuscript now entitled “Are behavioural interventions effective in increasing physical activity at 12-36 months in adults aged 55 to 70 years? A systematic review and meta-analysis”.

We are grateful for the positive and constructive comments from reviewer 2 and for the very positive evaluation from reviewer 1. I have revised the manuscript in line with the comments provided and enclose a marked version of the manuscript with modifications shown in red text. Below I list a point by point response to the issues raised and detail the changes made in response to each point.

Response to comments from Reviewer 1

Comment 1: The use of 'long-term' in the title to describe the effectiveness of PA interventions is somewhat misleading, since relatively few of the follow-up studies went much beyond 18 to 24 months following randomization. Perhaps the use of a more descriptive term might be in order such as 'effectiveness of PA interventions among older adults at 12-24 months: a systematic review and meta-analysis'.

Response: Thank you for your comment. We have now amended the title to reflect the length of follow-up. One included trial (ref 33) reported data at 36 months so we have used 12-36 months:

“Are behavioural interventions effective in increasing physical activity at 12-36 months in adults aged 55 to 70 years? A systematic review and meta-analysis”

Comment 2: pg 4, para 1 - Introduction - ....epidemiological evidence shows a relationship between PA and reduced risk - I'm assuming risk here is in reference to death and disease - but risk of what with some added specificity frame this introduction a bit better -- all-cause mortality and selected non-communicable disease (e.g.,CHD, stroke, DM, etc).

Response: Thank you. We have revised this sentence to add detail and ensure clarity:

“Epidemiological evidence shows a relationship between physical activity (PA) and reduced risks of coronary heart disease, Type II diabetes, and some cancers, as well as shortening life expectancy [1, 2].”
Response to comments from Reviewer 2

Comment 1: Title: please include the outcome of interest and intervention type in the title. The way the title reads at the moment, it wrongly suggests the systematic review aims at establishing the effectiveness of physical activity on any type of outcome (i.e. obesity, quality of life, etc) in people aged 55 to 70.

Response: Thank you for your observation. We have now amended the title to avoid ambiguity over the outcome of interest and intervention type:

“Are behavioural interventions effective in increasing physical activity at 12-36 months in adults aged 55 to 70 years? A systematic review and meta-analysis”

Comment 2: Abstract: please also clarify the aims in the abstract, by adding intervention type and outcomes. Also explain in the abstract what the authors mean by physical activity behaviours. In the methods, add and clarify the sensitivity analyses conducted in the study. The results need to include 95% CIs.

Response: We have now clarified and amended the abstract as suggested:

“Background. Retirement represents a major transitional life stage in middle to older age. Changes in physical activity typically accompany this transition, which has significant consequences for health and wellbeing. The aim of this systematic review was to evaluate the evidence for the effect of interventions to promote physical activity in adults aged 55 to 70 years, focusing on studies that reported long-term effectiveness. This systematic review adheres to a registered protocol (PROSPERO CRD42011001459).

Methods. Randomised controlled trials of interventions to promote physical activity behaviour with a mean/median sample age of 55 to 70 years, published between 2000 and 2010 were identified. Only trials reporting long-term effect (≥12 months) on objective or self-reported physical activity behaviour were included. Trials reporting physiological proxy measures of physical activity were excluded. Meta-analyses were conducted when trials provided sufficient data and sensitivity analyses were conducted to identify potential confounding effects of trials of poor methodological quality or with attrition rates ≥30%.

Results. Of 17,859 publications identified, 32 were included which reported on 21 individual trials. The majority of interventions were multimodal and provided physical activity and lifestyle counselling. Interventions to promote physical activity were effective at 12 months (standardised mean difference (SMD)=1.08, 95% CI=0.16 to 1.99, pedometer step-count, approximating to an increase of 2197 steps per day; SMD=0.19, 95% CI=0.10 to 0.28, self-reported physical activity duration outcome), but not at 24 months based on a small subset of trials. There was no evidence for a relationship between intervention effectiveness and mode of delivery or number of
intervention contacts; however, interventions which involved individually tailoring with personalized activity goals or provision of information about local opportunities in the environment may be more effective.

**Conclusions.** Interventions in adults aged 55 to 70 years lead to long term improvements in physical activity at 12 months; however maintenance beyond this is unclear. Identified physical activity improvements are likely to have substantial health benefits in reducing the risk of age-related illnesses. These findings have important implications for community-based public health interventions in and around the retirement transition.”

**Comment 3:** Introduction: It is not until the end of the introduction that it becomes clear that the authors aim to assess the effectiveness of interventions to promote physical activity on PA behaviour. This needs to be addressed earlier in the manuscript.

**Response:** Thank you for alerting us to this. We have now further highlighted our focus on physical activity behaviour at the end of the second and beginning of the third paragraphs of the Introduction:

“As PA levels are susceptible to change in retirement, then the retirement transition represents an ideal opportunity to intervene to increase and sustain PA behaviour and, in turn, encourage healthy ageing.”

“We are interested in promoting physical activity behaviours of people in and around the retirement transition.”

**Comment 4:** Methods: Why were studies from ‘less developed countries’ excluded from the review? And how might that affect the generalisability of your results?

**Response:** Our review focused deliberately on participants in and around retirement age in countries categorised as having a ‘very high level of human development’ (United Nations, 2011). Trials included in the review were conducted in the USA, Belgium, Netherlands, UK, Finland, New Zealand, Japan, Australia and Canada, which are ranked on the Human Development Index (HDI) as 4th, 18th, 3rd, 28th, 22nd, 5th, 12th, 2nd and 6th respectively. This inclusion criterion was chosen to ensure that the review focused on interventions that were applicable to populations experiencing broadly similar infrastructure, culture and standards of living. When we screened full publications for eligibility of inclusion (n=215), we did not identify any trials that were conducted in a country other than those included in the HDI as being of ‘very high human development’, which confirms the absence of relevant work in countries not ranked as such.

We acknowledge that this exclusion criterion limits the generalisability of our findings to lower income countries and as such we have included a sentence regarding this limitation in the Discussion (page 18):

“This review only included trials which had been conducted with participants in countries categorised as being one of the ‘most developed countries’ within the
United Nations index [24]. This inclusion criterion was chosen to ensure that the review focused on interventions that were applicable to populations experiencing broadly similar infrastructure, culture and standards of living. However, it is noted that consequently, the findings of this review may not be generalisable to lower income countries.”

Comment 5: Why was the search conducted back to 2000 only? This needs to be justified as well.

Response: There were two reasons to limit the searches back to 2000 only. Firstly, this review is part of a programme to develop behavioural interventions to improve health and wellbeing of people in and around the retirement transition, and one area of our focus is to promote physical activity behaviour. It was thought that the evidence obtained in the previous millennium was less likely to be directly relevant and applicable for future retirement transitions due to gradual historic changes in the legislative, economic, cultural and social context of retirement as well as to similar historic changes in health services.

Previous scoping searches have indicated that studies published after 2000 provide us with sufficient statistical power to test effectiveness with regard to self-reported physical activity. It is also known that accessibility to validate self-reports such as the I-PAQ was limited before 2000. For objective outcomes such as pedometers and accelerometers it was not expected that extending the search further back would contribute to the aims of this review either.

Comment 6: The results report effects at 12 months. Do the authors mean up to 12 months, or were trials with follow-ups of shorter length excluded from the review?

Response: Included trials had to assess and report physical activity behaviour at at least 12 months after randomisation. Some of these trials also reported data at shorter follow-up points but this data was not considered in this review. We have explicitly stated that studies that only had less than 12 month follow-up periods were excluded in the sentence which details the exclusion criterion (Method, page 5):

“Trials that only reported PA behaviour earlier than 12 months after randomisation, that only reported physiological proxy measures of PA as distinct from PA behaviour, were laboratory-based exercise studies, or promoted high or elite performance training were also excluded.

Comment 7: Please clarify what you mean by narrative analyses. Is it vote-counting? If yes, please report mean differences and 95% CI for individual trials whenever possible.

Response: Thank you for alerting us to this important point. When trials did not report sufficient data for meta-analyses or when the method of physical activity assessment or time of assessment was not equivalent to that used in any other trial, we conducted narrative analyses that reports all available information. This narrative
review is not guided by $p$ values but, where possible, takes into account the effect size of a trial with its estimated margin for error. We have now revised the Results section to ensure that where possible and data is available, SMD and 95% CI are reported for each individual trial that could not be meta-analysed. Your comment has significantly improved this section, thank you.

For readers’ information, we have also added a sentence indicating which authors provided unpublished data on request:

“Five authors provided additional data needed for meta-analyses including mean and standard deviation when only median and range were published and final values when only change scores from baseline were published [29, 31, 32, 41, 42].”

Comment 8: How was risk of bias assessed?

Response: Risk of bias was assessed using the Cochrane risk of bias tool (page 6, Method, Data Extraction) - Higgins et al. Cochrane handbook for systematic reviews of interventions version 5.1.0 In The Cochrane Collaboration; 2009.

Comment 9: Results: The results are focussed on types of outcomes, rather than types of interventions. The problem with this approach is that the reader is left with very little information on what type of approach is actually effective. There is no mention, except for one of the tables, of what the interventions were and which ones are effective and which aren’t.

Response: We thank you for this comment and have now added additional information regarding the content of interventions to the Results (page 9-10):

“All of the interventions, except one which involved group education and prescribed a standard PA goal of 150 minutes per week of moderately intense PA [31], were individually tailored to some degree. Five interventions provided participants with individually tailored exercise prescriptions, tailored on the basis of target heart rate [35, 45, 48], submaximal VO$_{2\text{max}}$ step test results [47] and baseline total energy expenditure [37]. The remaining interventions provided information specific to the individual to match their potential or actual health risk, their environment and local opportunities, and/or their individual PA goals. Thirteen of 21 interventions employed core self-regulation principles such as goal setting, planning, self-monitoring and providing feedback [28-30, 32-34, 36, 39-44].”

For self-reported outcomes, there is limited heterogeneity in the meta-analysis; therefore it is not advisable to extract suggestions about what exactly works and what does not. For the more heterogeneous objective outcomes, power is insufficient to conduct moderator analyses.
Comment 10: On page 10, do the authors mean ‘high attrition bias’ in the last paragraph?

Response: Thank you for this observation. We have added the missing word bias.

Comment 11: The report on trials comparing multiple interventions is vote-counting. Please see comment above.

Response: We have now addressed this issue and, where possible, SMD and 95% CI are reported for each comparison in each trial with multiple intervention arms. Please also see our response to comment 7.

Comment 12: Discussion: can results be generalised, given studies from lower income countries were excluded? What is your target population?

Response: Please see our response to comment 4 and the additional limitation we have added to the Discussion (page 18):

“This review only included trials which had been conducted with participants in countries categorised as being one of the ‘most developed countries’ within the United Nations index [24]. This inclusion criterion was chosen to ensure that the review focused on interventions that were applicable to populations experiencing broadly similar infrastructure, culture and standards of living. However, it is noted that consequently, the findings of this review may not be generalisable to lower income countries.”

Comment 13: There is high (95%) degree of between-trial heterogeneity in one of the analyses. Could that be caused by the inclusion of heterogeneous interventions? Please comment.

Response: To date, there are no objective methods to evaluate the heterogeneity of the content of complex lifestyle interventions. One can argue that there is considerable heterogeneity of the interventions identified for this review throughout, yet the largest meta-analysis of self-reported physical activity behaviour shows evidence for limited heterogeneity of effects.

It is possible that the answer to your question is ‘yes’, but one should also consider the possibility that the estimate of homogeneity has a larger margin for error in meta-analyses with limited power. We consider this as a viable finding. What we would not want to do is to run two meta-analyses and then make judgement on the suitability of the studies for meta-analytic review based on the findings. There is no obvious difference in the interventions used for both meta-analyses and from a behavioural science perspective we believe that it is not justified to conduct these analyses.
Many thanks to the reviewers for providing these helpful comments. We believe that the revised manuscript represents a significant improvement on that originally submitted.

Yours sincerely,

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