Reviewer's report

Title: Smartphone apps to improve fitness and increase physical activity among young people: protocol of the Apps for IMproving FItness (AIMFIT) randomized controlled trial

Version: 2
Date: 13 March 2015

Reviewer: Saskia te Velde

Reviewer's report:

General
An easy-to-read description of an interesting study, which is very relevant for the field

Major
Abstract
1. It would be helpful for the reader to describe in the background section of the discussion the choice for 2 existing apps and the rationale behind this choice, i.e. what content of the app is expected to be especially effective (the immersive/game-themed features) and subsequently the aims of the study. Why did you choose for apps that promote running?
2. Mention in the discussion of the abstract the pros and cons of the study design (not controlled) and the choice of the assessments (reliability, validity).

Background
3. Although this section is easy to read, it would make it easier to follow the methods section and the discussion if the background provides a rationale for the choice of the 2 applications with a description of the special features (i.e. the immersive properties). This rationale could also be illustrated by a conceptual model, e.g. that it is expected that apps may influence the presumed mediators (self-efficacy, enjoyment, psychological needs) and that this influences PA behaviour which in turn influences fitness. Then the choice for these 2 apps can be supported by the fact that one of those apps has immersive properties that are expected to positively affect these presumed mediators.
4. Please provide a definition of ‘immersive’, how can apps be categorized as having immersive properties.

Methods/design
5. Why was chosen for an 8 weeks intervention period. Is it realistic to expect changes in fitness? And sustained changes in behaviour? Moreover, the non-immersive app entails a nine-week training program.... So the participants in this intervention arm will be evaluated before they finish the training program?
6. Regarding the sample size calculation, can you provide the expected mean
value at baseline or for the control group? And was drop-out taken into account, so that you will aim for a higher number to recruit?

7. When you describe the applications (which I prefer to have already be introduced in the introduction/background), it is mentioned that self-regulatory behaviour change techniques were included in the app. Which techniques were that? It also mentions self-monitoring. How was this done, by logging or by means of GPS, or both?

8. Why do you chose for a control group that gets ‘nothing’ rather than a control group that gets only generic information about physical activity, or usual care, like the advice they would get from a health worker or school nurse?

9. Please provide more information on the one mile run/walk test. How valid is this test and how sure are you that changes are due to improvement in fitness, rather changes in running economy or measurement error, or other random issues?

10. Can you provide example questions for the utilization, acceptability and usability of the apps? Will you also ask if they intend to keep on using the app (if that is possible after finishing an 8 or 9 weeks training program)

11. In the statistical analyses section, please describe that you will first test all assumptions for ANCOVA, e.g. normally distributed outcome variable and/or residuals.

12. Please proved a bit more information regarding the mediation analyses. It will help to refer to a conceptual model describing the hypothesized underlying pathways that will be tested.

Discussion

13. I do miss some reflection on the apps that were chosen, based on your rationale that immersive/game-based apps will be effective in increasing intrinsic motivation and subsequent behaviour and fitness, you expect of course that there will be an effect. But what will it mean when no effect is detected? Will it be due to the behaviour change techniques and content of the app? Or will it be due to the short follow-up period? Will it be that both apps promote running and not daily activities that are easier to incorporate in daily life?

14. I also miss some reflection on the measurement instruments, about their validity and reliability etc.

Minor Essential

15. How long will it take to complete the whole questionnaire? Please provide this information

16. In the statistical analyses section you mention that all data will first be entered into an Excel database, I guess this does not include the Actigraph data? And how will all data be entered? Will somebody do this manually? If so, how will the data be checked and cleaned, please include those procedures as well.

17. First sentence of the discussion section, please mention that it concerns 2 commercially available apps, now it may seem that you test more than 2.
18. Please and the discussion with a final conclusion or summary of 2 or 3 sentences.

**Level of interest:** An article of outstanding merit and interest in its field

**Quality of written English:** Acceptable

**Statistical review:** Yes, and I have assessed the statistics in my report.

**Declaration of competing interests:**
I declare that I have no competing interests