Author's response to reviews

**Title:** A school-based rope skipping intervention for adolescents in Hong Kong: Protocol of a matched-pair cluster randomized control trial

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**Author's response to reviews:** see over
Dear Editor

I would like to hereby submit a revision to our manuscript titled “A school-based rope skipping intervention for adolescents in Hong Kong: Protocol of a matched-pair cluster randomized controlled trial” (MS: 1569784031111851).

Following your suggestion, we have added the trial registration date in the manuscript. Below we also provide a point-by-point response to comments and suggestions raised by the two referees. We have kept the original comments made by the referees in black, and provided our responses to each point using a red font. Similarly, changes that were made in the manuscript were marked in red. We did not track or mark the deletions in the manuscript as there were very few of them, and they were all minor changes.

Following the suggestion by a referee, we have also submitted a completed CONSORT checklist as a supplementary document for our resubmission.

The manuscript is now 23 pages long, with 2 figures. I have gone through the manuscript to ensure the format is consistent to the requirements of the journal.

We look forward to hearing from you soon.

Regards
Amy Ha

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Reviewer 1
This paper reports on the protocol for a group randomised trial evaluating a rope skipping-based fitness infusion intervention to increase MVPA during PE among secondary school students. The design appears to be methodologically sound and the protocol is appropriately reported. Some suggested modifications are below.

We thank the Reviewer for the positive comments.

Minor Essential Revisions (such as missing labels on figures, or the wrong use of a term, which the author can be trusted to correct)

Background:
1. “In order to attain health benefits, however, it has been suggested that school PE should be designed to keep students active for at least 50% of the class time [6]”
Suggest modifying. Health benefits can still be gained from <50% MVPA during PE. Rationale for >50% PA in PE is that prevalence of habitual PA for youth is low and that PE, as a key context during which all youth should have the opportunity to engage in PA, should include >50% active time.

Based on the suggestion of the reviewer, we have now modified the sentence to read:

“to counter low habitual PA levels, it has been suggested that school PE should be designed to keep students active for at least 50% of the class time”

2. “In this study, we examined whether perceived autonomy support may be associated with students’ autonomous motivation to PE, and therefore their engagement in PE.”
Change to future tense – ‘in this study we propose to examine”

The sentence has been modified based on the Reviewer’s suggestion.

Methods
3. “Students will need to complete the PAR-Q to assess their physical health and readiness to take part in physical activity. Only students deemed to have sufficient physical health will be eligible to take part in the study.” Write PAR-Q in full and note how sufficient or insufficient health is determined.

We have written out PAR-Q in full and added the reference for the questionnaire. The following sentence was also modified as below:

“Based on the response to the questionnaire, students having no known undesired physical reactions (e.g., chest pain, dizziness, joint problems) to physical activity will be considered eligible to take part in the current study.”

4. “students taught using the bad practices to be shown in the video spent 20.8 ± 3.6 of the five-minute period in MVPA”
Missing percent

The word “percent” was inserted.

5. “The will be encouraged”
They will be

The modification was made accordingly.

6. “(to experimental of control condition)” experimental or control

Amended as suggested by the Reviewer.

7. “To ensure intervention fidelity (experimental group) and test for any contamination effects (control group), raters blinded to study hypotheses and class allocation (to experimental of control condition)”

After the first lesson the observers will be aware that some classes are doing typical lessons and others are beginning with rope skipping. Is it appropriate to say that they will be blinded to group allocation?

As rope skipping is included in the PE curricula of other schools in Hong Kong, and raters may not be sent to observe the same class each week, they may not notice the allocation of groups. However, we agree with the Reviewer that raters aren’t exactly “blinded” to group allocation, we have removed “and class allocation” from the manuscript.

This will be measured using ActiGraph GT3X+ accelerometers. MVPA will be defined using Evenson and colleagues’ criteria [26], and 1-second epochs will be used.

8. Provide company details for Actigraph

ActiGraph company details have now been added.


The choice of Evenson’s cutpoints was justified; the Trost et al. reference suggested by the Reviewer above was added.


As suggested by the Reviewer, we have added the Sanders et al. reference to support our decision.

11. “Secondary outcomes include students’ time spent in sedentary, light, moderate, and vigorous physical activity.”
Add – as measured by accelerometry and defined using Evenson et al (Ref) cut-points.

The sentence was added as suggested by the Reviewer.

Discussion
12. “In conclusion, the results to our study”
the results from our study

Amended as suggested by the Reviewer.

Discretionary Revisions (which are recommendations for improvement but which the author can choose to ignore)

13. “Furthermore, after controlling for students’ autonomous motivation and perceived autonomy support from their teachers, students in the experimental group, compared to those in the control group, will spend higher percentages of time in MVPA during three lessons when the intervention is applied”

Should this be - “after controlling for students’ autonomous motivation and perceived autonomy support from their teachers at baseline”? If the reason that the intervention group is more active during PE is because the intervention increases these factors, then you control for these factors, is there a risk of adjusting away the intervention effect? Although this is unlikely to happen (change in lesson content to skipping might also contribute to increased PA above motivation and perceived autonomy support, plus other factors), it is worth considering the analysis plan at this stage.

Our initial idea was to adjust analyses for changes in students’ autonomous motivation and perceived autonomy support. As suggested by the Reviewer, we will conduct analyses with and without adjustment for these potential confounders. The text has been amended to the following:

“For our primary outcome of students’ percentage time spent in MVPA, the effects of group allocation and student gender on percentages of time spent in MVPA will be examined using a multilevel regression model. The group x gender interaction effect will also be examined to determine whether the effect of the intervention is homogeneous across genders. Further, we will also examine a model by adding perceived autonomy support, autonomous and controlled motivation as potential confounders of the outcome.”

Reviewer 2

General Comments

1. This protocol is predicted on the need for more moderate-to-vigorous physical activity (MVPA) in physical education (PE) lessons. This is fine but more needs to be said about PE being not only about MVPA. There will be lessons and parts of lessons necessarily less active. This needs adding.

In response to the Reviewer’s comment, we have added the following text:

“Apart from that, another important role of PE is to provide students with knowledge, skills, and confidence to stay active throughout their lifetime [5]. Through PE, students can also acquire self-management skills, and to experience and learn about different types of games and activities [6].”

2. Revisions to some tenses are required. I think all should be future tense as the study has yet to be done. Correct?

As suggested by the Reviewer, the manuscript has been amended to the future tense.

3. In one sense this is a simple intervention, based on a rationale provided from a meta-
analysis conducted by the same authors. That’s all good. But equally, it could be seen to be quite trivial. Isn’t it obvious that if you train teachers to insert 15 mins of rope skipping into a lesson, MVPA will go up?

This is a good point raised by the Reviewer. We have now provided an extended rationale for our study. See below:

“The evaluation of this protocol is important because although students are expected to spend a high percentage of time in MVPA during the 15-minute rope skipping activity, it remains to be seen if the intervention increases the overall proportion of lesson time spent in MVPA compared to existing lessons. For instance, the contents of existing PE lessons may provide students with similar exposures to MVPA. If student MVPA levels increased during the 15-minute period, compensation effects may exist such that students may be less active during portion of the lessons [33]. Further, the current protocol allows us to explore whether the intervention effect is homogeneous across boys and girls. This is important because boys and girls may have different preferences towards the type of activity or game played [34]; therefore, examining the interaction effect on boys and girls separately may assist in future interventions or school policies aimed at increasing students’ activity levels.”

4. I find the question about motivational orientations more interesting yet little is said about this. Are you doing anything to increase autonomy? There is also no detail how this is being measured (see below).

We agree with the reviewer that motivational orientations are also interesting constructs to examine. Therefore, we have now added a sentence to describe the analyses we will conduct on motivational variables:

“To examine whether the intervention would lead to changes in motivation variables and perceived autonomy support by teachers, these variables will be regressed on group, gender, and group x gender in an additional series of three-level regression analyses.”

5. Why is there no process evaluation? I think it’s important to find out if the pupils like the skipping, get bored, are frustrated etc. What do the teachers think? How sustainable is it?

This is a good point raised by the Reviewer. We now include a more detailed description of the process evaluation of the intervention. See below:

“After the collection of quantitative data for the study, all (i.e., 12) teachers in the experimental group will be interviewed individually. The students (seven per class) in the experimental group who wore accelerometers during the study will be invited to take part in focus group interviews. Interviewees will be asked their views on the intervention, such as whether they, or felt other students, enjoyed the new approach. Teachers and students will also be asked whether they felt the intervention was successful in increasing students’ activity levels. We will seek their opinion in terms of whether the intervention could be promoted to other schools, and how it could be improved.”

6. There is no mention of CONSORT guidelines but BMC Public Health say that RCTs should follow these guidelines.

We have now completed a CONSORT statement and submitted it as a supplementary
Specific Comments
1. Title: controlled not control?
   Modified as suggested.

2. P5, para 1: add something that recognises that PE is not just about MVPA. If it were, we wouldn’t need PE teachers.
   In response to comment 1, we provided a more detailed description of the objectives of PE.

3. P6: the SDT focus is a potential strength, but I feel it’s underplayed.
   As our study and the intervention involved were not designed to be SDT-focused, we feel we have already covered the essential tenets of the theory.

4. P7, para 2: why wouldn’t the skipping increase MVPA? It would be extraordinary if you didn’t get effects.
   See response to comment 3.

5. P8, para 2, line (L) 1: schools
   Modified as suggested.

6. P8, para 3: why do you need to administer the PAR-Q? You are using normal PE lessons.
   We administered the PAR-Q because this is required (by ethic committees) for all studies that require participants’ engagement in physical activity.

7. pp8-9: you say the study ‘will begin’, yet give dates in the past.
   This paper was submitted before the start date and hence future tense was used throughout the study. We have kept the use of future tense for the protocol for the sake of consistency.

8. P9: it is not clear who these rope skipping ambassadors are and what they do.
   Following the Reviewer’s comment, we have inserted the section to describe the main roles of ambassadors:
   “The main roles of ambassadors will be to assist teachers in running the classes, demonstrate rope skipping skills taught by the teacher, and to ensure teachers adhere to the structured plan provided to them during the training.”

9. P10, para 2, L5: they
   The correction was made as suggested.

10. P11: so is there a motivational intervention? I was expecting one. Why would simple rope
skipping make any difference to motivation other than through novelty?

No there will be no motivational intervention in the current study. Therefore, we were not expecting the intervention to change students’ motivation towards PE. This also explains why we did not put too much effort in explaining SDT in the introduction section of the paper.

11. P11, para 2, L4: or, not of

The correction was made as suggested.

12. P11: good use of SOFIT

We would like to thank the reviewer for acknowledging our use of the tool for a slightly different purpose to what it was designed for.

13. P12: can you say how valid and sensitive the accelerometers are for accurately detecting skipping when some (much?) movement will be ‘on the spot’ and not involve lateral movement.

We have inserted a section to describe the pilot study we’ve conducted. This provides some evidence supporting the validity and sensitivity of using accelerometers in our study:

“To test the validity and sensitivity of the devices of capturing non-lateral movements such as rope skipping, we invited 12 boys and girls with varying rope skipping experience perform rope skipping tricks (in 1-minute bouts with at least one minute rest in between) that will be included in the intervention while wearing accelerometers. For all skippers and for all tricks tested, the activity was classified as MVPA based on Evenson et al.’s cut points.”

14. P12: I don’t quite follow the statement on secondary outcomes. Do you mean time in physical activity outside the lessons? If not, isn't this repeating some of the primary outcome?

In response to the Reviewer’s comment re secondary outcomes, we were also referring to physical activity behaviors within the PE lesson. As mentioned in our responses above, the main focus and outcome of the current study is MVPA. We considered all other outcomes secondary, including time spent sedentary, and time spent in light intensity physical activity. We also included moderate physical activity and vigorous physical activity as secondary outcomes, in order to investigate intervention effects on these intensities separately, as opposed to the primary outcome of MVPA which combines these two intensities.

15. P13, para 1: how will you measure the psychological variables? Need detail of the actual questionnaires, validity etc.

Details of questionnaires measuring psychological variables were added to the manuscript:

“Specifically, the 6-item version of the Learning Climate Questionnaire [30] will be used to measure students’ perceived autonomy support provided by their teachers. The original scale in English was translated into Chinese using a back-translation protocol. As the translated scale has not previously been used, factorial validity of responses will be examined before the main analyses are conducted. In terms of motivation orientations, the Chinese Perceived Locus of Causality Questionnaire (PLOCQ) [31] will be used to measure autonomous and
controlled motivation. Evidence of validity and reliability of the scale have been shown by Lonsdale et al. [31].”

16. P15: I was hoping to see a section here on process evaluation.

A section describing teacher and student interviews has been provided in response to comment 5.