Author's response to reviews

Title: A youth-led social marketing intervention to encourage healthy lifestyles, the EYTO (European Youth Tackling Obesity) project: A cluster randomised controlled trial in Catalonia, Spain.

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Author's response to reviews: see over
Dear Natalie Pafitis,

Thank you for the opportunity to submit a revised/improved version of our manuscript entitled: A youth-led social marketing intervention to encourage healthy lifestyles, the EYTO (European Youth Tackling Obesity) project: A cluster randomised controlled trial in Catalonia, Spain.

In submitting this revised version, we have taken into account all of the Reviewers’ comments (itemised in the following pages) and, where required, we have made appropriate changes in the main text. The changes are highlighted in yellow in the main text, and the page/line numbers are noted in this response-to-reviewer document.

We hope that the revised version has met the quality requirements for inclusion in the *BMC Public Health*.

Yours sincerely,

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Comments from the reviewers

Reviewer 1: Andrew Springer

- **Level of interest:** An article of importance 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 I have not competing interests

Reviewer's report:

This paper describes the study protocol and intervention approach for The European Youth Tackling Obesity (EYTO) project, a “multicentric intervention project with participation from the United Kingdom, Portugal, the Czech Republic and Spain.” The paper specifically presents the approach for the Spanish site of the study. The multi-site study is innovative and will make an important contribution to the field. Despite these strengths, there are several aspects of the current paper that merit further consideration:

**Major Compulsory**

**Point 1. Aim of the paper: The purpose statement of the paper is not explicit. In the abstract, the authors state: “...this protocol describes the participation of the Spanish team specifically.” First, it appears authors are referring to the paper under review as ‘the protocol’, which is confusing. Secondly, more explicit language would enhance the paper purpose statement, such as: “This paper describes the EYTO intervention and study design (or protocol or methods) for the overall intervention and specifically for the Spanish study site.” (or something to that effect).**

**Response 1.** In this paper, we describe the Spanish intervention study called “Som la Pera” intervention, which is a cluster randomised controlled trial implemented in Catalonia, Spain. As this Spanish intervention belongs to the EYTO project, a brief description of the EYTO project is included. According the reviewer’s recommendation, we improved the purpose statement of our paper in the Abstract (pg 4, ln 84): “this paper describes the “Som la Pera” intervention Spanish study that is part of the EYTO project”.

**Point 2. Literature review:**

**Point 2A.** The authors state (p.6): “Nutrition education, increasing physical activity (PA) and reducing sedentary behaviors are the principal behavior modifications that can prevent or reduce the risk of OB.” Here, the authors are conflating ‘nutrition education’ with ‘healthy eating’. Nutrition education is one strategy for improving healthy eating, but is not a ‘behavior modification’. Please fine-tune. Furthermore, as this is a statement of fact, please include a citation.

**Response 2A.** We corrected the mistake regarding nutrition education for healthy eating, and we added a citation in the Background section (pg 6, ln 137): “The improvement of healthy lifestyles through modification of eating habits, daily physical activity practice and avoiding sedentary behaviour are the principle modifications that can prevent or reduce the risk of obesity [Lobstein et al., 2015]”.

This new reference had been added to the manuscript.

**Reference:**

Point 2B. P.6: What does “good strategies” mean? “Effective strategies”? Evidence-based strategies? Additionally, the paper cited in this sentence refers to a review on social marketing for obesity prevention. As this sentence refers to a statement on evidence for improving availability and quality and reducing prices of healthy foods and providing access to sports grounds, please cite the primary studies that support this statement and provide evidence for these intervention approaches.

Response 2B. The authors refer to good strategies as evidence-based strategies. We changed this term in the Background section, and we updated the references (pg 6, ln 139): “Evidence-based strategies include encouraging people in disadvantaged areas to eat healthier by improving the availability, quality and pricing of healthy food in these localities [Krukowski et al., 2010] and encouraging them to perform more physical activity by providing access to sport grounds and green spaces [Evans et al., 2012].” We checked the references, and there was a mistake in this reference; we replaced it with the correct reference.

This new reference has been added to the manuscript.

Reference:

Point 2C. P.6. The authors provide a good rationale for exploring other intervention approaches for obesity prevention that match with their developmental lifespan stage.

Response 2C. Thank you for your observation.

Point 2D. Consider further citation of the literature: P.7. The authors state: “Some studies suggest that the use of SM strategies to modify behavior, lifestyles and other aspects of diet and PA using an intervention, program or campaign can reduce the overweight or OB prevention among children and adolescents. However the analysis and conclusions are not decisive because there are very few interventions that expressly use the SM criteria.” Lacking from the current literature review is citation of research that has used social marketing approaches to promote energy-balance behaviors. For example, while the authors cite a descriptive review of social marketing applied to obesity prevention on p.6 (the reference I suggested changing above, ref #9), they do not cite the literature in this review that has used social marketing approaches (e.g., Evans WD, Necheles J, Longjohn M, Christoffel KK. The 5-4-3-2-1 go! Intervention: social marketing strategies for nutrition. J Nutr Educ Behav; Huhman M, Potter LD, Wong FL et al. Effects of a mass media campaign to increase physical activity among children: year-1 results of the VERB campaign. Pediatrics 2005;116:e277–e284. 2007;39:S55–S59.) or other youth-led health promotion approaches (e.g., Campbell et al., ASSIST smoking prevention, Lancet 2008). This research would provide a stronger foundation for the proposed youth-led social marketing intervention by providing theoretical and empirical evidence that social marketing and youth empowerment approaches have been shown to be effective in health promotion/behavior change. On this related note, given that there is evidence of previous interventions using social marketing-related strategies for behavior change in youth, were these other interventions less effective because they did not use all “SM criteria”? Or is the suggestion that these intervention approaches can be more effective by explicitly addressing all “SM criteria”? Less definitive language should be considered if there is no evidence that these 8 basic SM criteria can increase behavior change. I recommend being more
explicit in stating that this study will help evaluate whether those criteria really are effective in addition to the delivery of those criteria via a youth-led approach.

Response 2D. According reviewer’s proposal, we improved the Background section (pg 7, ln 170):

“Some studies suggest that the use of social marketing strategies to modify behaviour, lifestyles and other aspects of diet and physical activity through an intervention (target audience played an active role) or a campaign (target audience played a passive role) can reduce the overweight or obesity prevalence among children and adolescents. There are some social marketing campaigns that demonstrate positive attitude and behaviour effects in children, such as the VERB social marketing campaign to increase physical activity among youth [Berkowitz et al., 2008]. Canada's ParticipACTION national physical activity mass media campaign targeting parents of elementary school-aged children [Craig et al., 2009] and an intervention focused on improving the snacking habits of pre-school children [Richards et al., 2009]. By contrast, “The 5,4,3,2,1 go! Intervention” [Evans et al., 2007] demonstrated effects on parental behaviour and did not affect children [Evans et al., 2011]. The Change4Life campaign, a national social marketing program implemented in the United Kingdom to reduce obesity [Crocker et al., 2012 demonstrated positive effects on awareness but little impact on attitudes and behaviours. However, the effectiveness of these campaigns requires further research on behaviour modification using randomised, controlled intervention studies to determine the appropriate number of criteria and the key social marketing criteria that will have the greatest impact on achieving the intervention objectives”.

Moreover, the following references have been added to the manuscript.

References:


Point 3A. Intervention: Details on the intervention plan of action are lacking. For example, what is the overall framework of the intervention?

Response 3A. We improved the intervention details in the Methods, Intervention section (pg 12, ln 291): “The 5 ACCs designed social marketing activities proposed as challenges based on 8 SMBCs: 1) customer orientation, 2) behaviour, 3) theory, 4) insight, 5) exchange, 6) competition, 7) segmentation and 8) methods mix (Table 2). These 5 ACCs were recruited separately from two different high-schools. Then, the 5 ACCs, as peer-led instructors, identified the possible lifestyle components that they and their peers should improve, selected the easiest and most common communication channels among them, and determined which challenges should be designed and implemented for their peers.”.
Response 3B. To clarify the training sessions, we improved the Abstract (pg 4, ln 91): “From the intervention group, 5 adolescents with leadership characteristics, called “Adolescent Challenge Creators” (ACCs) were recruited”, and (pg 4, ln 92): “These 5 ACCs received an initial 4 h training session about social marketing principles and healthy lifestyle theory, followed by 24 sessions (1.30 h/session) divided in two academic years to design and implement activities presented as challenges to encourage healthy lifestyles among their peers, the approximately 180-200 high-school students in the intervention group”, and in Methods, Spanish study design section (pg 10, ln 236): “The 5 ACCs received a 4 h initial training session about social marketing principles and the healthy lifestyle theory from a university specialist in health and communication. Moreover, the 5 ACCs received 1.30 h of training every week over 12 weeks (1st academic year) and 1.30 h of training every week over 12 weeks (2nd academic year), a total of 12 sessions/academic year, leading to a total of 24 sessions (1.30 h/session), also performed by a university specialist. The aims of the sessions were to train the 5 ACCs on health promotion, health education, communication and social media so that they could design the challenge activities for their peers. The university specialists educated the 5 ACCs about the primary and secondary objectives of the intervention, and the ACCs then had to design the challenges for their schoolmates to accomplish the defined objectives”.

Response 3C. We added this information to the Methods, Spanish study design section (pg 11, ln 266): “The costs of this meeting were included in the project funding.” and to the Methods, Intervention section (pg 12, ln 299): “The ACCs designed and implemented the following challenges: gymkhanas (an activity inside high-schools in which adolescents were divided by teams and competed among themselves in different sport and food tasting competitions, such as goal scoring, racing, or discerning foods with one’s eyes closed) and cooking ability and lifestyle knowledge competitions (high-school cooking competition to prepare healthy dishes simulating cooking TV show or quiz show), as well as pop-up events that included healthy cooking contests and lifestyle knowledge competitions. The 5 ACCs had to be in touch with community stakeholders to obtain some resources free of charge. For example, Central Mercat de Reus gave them food to develop cooking competitions and run the gymkhana, and local government provided local community spaces to develop challenges. Moreover, material costs for items such as posters, flyers, etc. were paid for by the project budget”.

Response 3D. We added this information to the Methods, Spanish study design section (pg 11, ln 261): “5 challenges designed by the ACCs over the first year in the intervention high-schools for a period of 12 weeks” and to the Methods, Spanish study design section (pg 11, ln 267): “The fourth phase involved reimplementation of the intervention during the second academic year, for a period of 12 weeks, with 5 more challenges designed by the ACCs.”.

Response 3E. We improved Table 2 using more concrete examples of how we achieved each social marketing criterion.
Research group | Adolescent Challenge Creators (ACCs) | Research group and Adolescent Challenge Creators (ACCs)
---|---|---
1. **Customer Orientation**: Focuses on the audience to help understand their lives, behaviours and issues.  
The peer-led model attracts the motivation of adolescents to participate and interact in the intervention, because adolescents prepare activities directed to adolescents. In this way, it has in mind their motivations and behaviours. | 2. **Behaviour**: Aims to change people’s actual behaviours.  
Aims to improve the consumption of fruits and vegetables, PA practice, and breakfast consumption and decrease the TV, PC and video game behaviour. | 3. **Theory**: Uses behavioural theories to understand behaviour and to inform the intervention.  
It used the behavioural change framework, taking into account the “Behaviour Change Wheel” (Michie, van Stralen, & West, 2011).

5. **Exchange**: Considers the benefits and costs of adopting and maintaining a new behaviour. The perceived cost can be social, economic, or physical.  
The consideration of the cost-effectiveness of the intervention will be evaluated at the end-of-intervention. | 4. **Insight**: develop a deep understanding of the target audience.  
The peer-led model motivates adolescents to participate and interact in the intervention because adolescents prepare activities directed towards adolescents. In this way, it has in mind their motivations and behaviours. | 6. **Competition**: Seeks to understand the possible barriers for the audience’s time, attention, and inclination to behave in a particular way.  
The 5 adolescent coordinators discussed the enablers and barriers that adolescents face when making behavioural changes. From this debate, some changes were proposed to facilitate the process by including stakeholders.

8. **Methods Mix**: Uses a mix of methods to bring about behavioural change. Does not rely solely on raising awareness.  
It contributed to informing using social media, educating using activities designed by adolescent coordinators and social media, and supporting using visual material in high-schools and social media. The design and control will be applied using the suggestions provided by 5 adolescent coordinators. | 7. **Segmentation**: Identifies audience “segments” that have common characteristics and then tailors interventions appropriately.  
The intervention is focused on adolescents 13 to 16 years of age who attend the participant high-schools and are from low socioeconomic status neighbourhoods.

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**Point 3F. What is the theoretical framework for the intervention? (e.g., is their youth empowerment theory that is being applied? Why should we think the 8 SMBC criteria will be effective in changing behavior?)**

**Response 3F.** The base of the EYTO project is the youth empowerment theory. Moreover, in the Spanish youth intervention a behavioural change framework was used, taking into account the “Behaviour Change Wheel” (Michie, van Stralen, & West, 2011).

We improved the Methods, European Study Design section (pg 9, ln 202): “The intervention should encourage healthy lifestyles among their peers of the same age in disadvantaged neighbourhoods; the adolescent peer-led model is more effective at achieving positive results in health behaviour than the adult-led models applied in school-based studies [Mellanby et al., 2000]. Adolescent peer-led interventions use the youth empowerment theory based on engaging young people in the decision-making process to improve their health and well-being [Morton & Montgomery, 2013]”.

The following new references have been added to the manuscript.

**References:**

Response 4A. We improved the Methods, Spanish study design section (pg 10, ln 231): “High-school teachers from the randomised intervention group selected the five adolescents according to their knowledge of the students by considering leadership characteristics and English level (because the students will participate in EYTO European meetings), 2 adolescents from one high-school and 3 from the other high-school”.

As an easy and rapid way to design and prepare the challenges, 5 ACCs were included per country. Moreover, with the inclusion of more than one adolescent per high-school, the challenge intervention design and implementation tasks could be distributed. We added the following to the Methods, European study design section (pg 9, ln 201): “The selection of 5 ACCs per country was done as an easy and rapid way to design and prepare the challenges”.

Response 4B. As we stated in the previous question, we improved the explanation of the high-school participants’ selection, in the Methods, Spanish study design section (pg 9, ln 221): “Local authorities have already identified public high-schools that they agree serve low-income neighbourhoods that are considered disadvantaged areas. From the 9 public high-schools identified in these neighbourhoods, 4 high-schools were randomly selected. The randomisation code was computer generated. The high-schools were assigned to the control or intervention arm at a ratio of 1:1 via an interactive electronic response system hosted by the Nutrition and Health Technology Centre (CTNS) in Reus, Spain. The unit responsible for the randomisation took no further part in the study. Because the researchers know the names of the four high-schools, allocation concealment was not performed.”

As the reviewer suggested, we added a detailed intervention description in Table 1 for the different high-schools included in the study: low socio-economic level percentage, high-school size, public or private and geographic location were included. The high-school percentage of low socioeconomic level was defined using the percentage of low socioeconomic neighbourhoods defined by local authorities that feed into this high-school.
<table>
<thead>
<tr>
<th>Arm</th>
<th>High school information</th>
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<tbody>
<tr>
<td>Intervention Group</td>
<td>High-school A</td>
<td>The intervention group will receive an intervention consisting of challenges designed by 5 ACCs. These activities must have social marketing criteria.</td>
<td>High-school A Students from high schools from low-income neighbourhoods, who are 13 to 16 years of age: a) 3 to 5 ACCs b) 80-100 adolescents</td>
<td>Primary outcome: consumption of fruits and vegetables, physical activity practice, and TV/computer/game console use. Secondary outcomes: breakfast consumption, engagement with local recreation and obesity prevalence</td>
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<td>High-school B</td>
<td>No intervention assigned for this group;</td>
<td>High-school A Students from high schools from low-income neighbourhoods, who are 13 to 16 years of age: b) 80-100 adolescents</td>
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<td></td>
<td>Economically disadvantaged Size: 4 classes/level Public Reus</td>
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<td>High-school B Students from high schools from low-income neighbourhoods, who are 13 to 16 years of age: b) 80-100 adolescents</td>
<td></td>
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<tr>
<td>Control Group</td>
<td>High-school A</td>
<td></td>
<td>High-school A Students from high schools from low-income neighbourhoods, who are 13 to 16 years of age: b) 80-100 adolescents</td>
<td>The same outcomes were measured with the same tools and over the same time frame as in the intervention group.</td>
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Point 4C. P. 9: Authors state: “From these neighborhood, the randomization of high schools was performed.” Are the authors meaning to state: “Random selection?” I am not understanding how randomization is being used in this sentence. Also, were schools purposively selected from the 9 schools, or randomly selected?

Response 4C. As explained in the last question, we improved the information provided about the randomization in the Methods, Spanish study design section (pg 9, ln 221): “Local authorities have already identified public high-schools that they agree serve low-income neighbourhoods that are considered disadvantaged areas. From the 9 public high-schools identified in these neighbourhoods, 4 high-schools were randomly selected. The randomisation code was computer generated. The high-schools were assigned to the control or intervention arm at a ratio of 1:1 via an interactive electronic response system hosted by the Nutrition and Health Technology Centre (CTNS) in Reus, Spain. The unit responsible for the randomisation took no further part in the study. Because the researchers know the names of the four high-schools, allocation concealment was not performed.”

Point 4D. p. 9: Why are physicians needed to lead the implementation of the study if the main measures are self-reported behaviors via the WHO HBSC survey? What specific “clinical aspects” of the study will be evaluated?

Response 4D. We apologize for the mistake; this project did not evaluate clinical aspects, only self-reported behaviours. However, the physicians are in charge of designing, performing and evaluating the behaviours thought the study. We included this in the Methods, Spanish study design section (pg 10, ln 247): “Physicians: Physicians led the implementation of the study from the recruitment process to the end of the experimental protocol. They were in charge of designing, performing and evaluating the self-reported behaviour aspects throughout the study.”

Point 4E. P.10: Why will nutritionists be in charge of determining the primary and secondary outcomes throughout the questionnaire? The authors also state: “The nutritionists will be responsible for dietary and public health training.” Of whom? The five adolescent leaders?
Response 4E. As we explained in the text, researcher nutritionists are in charge of assessing behaviour change through the questionnaire. Moreover, nutritionists were in charge of the training the 5 ACCs regarding dietary and healthy lifestyle recommendations so that the ACCs were appropriately prepared to transmit adequate information to their peers.

We improved the Methods, Spanish study design section (pg 11, ln 250): "Nutritionists: Nutritionists led the high-school recruitment process and coordinated the logistical issues of the trial. They contributed to evaluating the primary and secondary outcomes through the questionnaire. The nutritionists were responsible for the dietary and healthy lifestyle training of the 5 ACCs.”

Point 4F. P.12: Please consider inserting another subheading that states: “Primary Outcomes and Measures”- or something to that effect, to distinguish from the section on the intervention.

Response 4F. As the reviewer recommended, we introduced the following subheading in the Methods section (pg 13, ln 312): “Primary and secondary outcomes”.

Point 5A. Discussion Section: This section would benefit from greater enhancement and fine-tuning. For example, authors state: “This study protocol describes the effectiveness of an intervention aimed at…” Again, consider “this paper” as this is not the actual study protocol. Secondly, the paper does not describe the effectiveness, as no findings are presented.

Response 5A. As the reviewer suggested, we changed the Discussion section (pg 15, ln 351): “This paper describes an intervention aimed at improving lifestyles, such as nutritional habits and physical activity practice, for obesity prevention in socioeconomically disadvantaged and vulnerable adolescents.”

Point 5B. P.14: “Based on the current high rates of OB…” High rates where? In Spain? Worldwide?

Response 5B. We added this information to the Discussion section (pg 15, ln 354): “Based on the worldwide current high rates of childhood and adolescent obesity [Lobstein T et al. 2015], the fight against adolescent OB is a significant public health objective”.

References:

Point 5C. “This summary represents…” What summary? The ref. 34 intervention, or the current EYTO intervention? If the current EYTO intervention study, then the summary does not present an evaluation of the study but rather a description of the intervention and study methods. Overall, fine-tuning of the discussion is needed.

Response 5C. We improved the Discussion section (pg 15, ln 366): “This paper describes the “Som la Pera” intervention Spanish study, which is part of the EYTO project.”

Discretionary Comments
Response to Reviewers

Point 6. If the baseline has already taken place, have the authors considered presented their baseline findings along with this description of the intervention?

Response 6. We think that the reviewer’s suggestion is an interesting option, but since the beginning of the project, we have planned to present the baseline results with the final results to compare the changes and improvements.

Point 7. Edits: P.7: “…core SM concepts that takes into account…”

Response 7. We edited the Background section (pg 7, ln 165): “The purpose of this benchmark is to create support for a better understanding of social marketing that takes into account the 8 basic SMBC principles”.

Reviewer_2: Amy R. Mobley

- **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 I have no competing interests

Reviewer's report:

Thank you for the opportunity to review this manuscript. The manuscript describes a study protocol for a youth-led social marketing campaign for adolescents in Spain as part of a larger European project. I agree that more rigorous research is needed to test the effects of social marketing campaigns especially for obesity prevention and in underrepresented populations. The study design appears to be adequate in testing the hypotheses but details were sometimes unclear in different sections of the manuscript.

Suggestions for revisions are as follows:

**Major revision**

**Methods section:**

Point 1. How were the 4 schools selected? Did you determine if schools had similar characteristics prior in terms of the student characteristics or academic records?

Response 1. According to reviewer’s comment, we improved the Methods, Spanish study design section (pg 9, ln 221). Public high-schools in Reus were used because public high-schools have similar students and environmental characteristics. The public high-schools chosen have similar percentages of children of low socioeconomic status: *Local authorities have already identified public high-schools that they agree serve low-income neighbourhoods that are considered disadvantaged areas. From the 9 public high-schools identified in these neighbourhoods, 4 high-schools were randomly selected. The randomisation code was computer generated. The high-schools were assigned to the control or intervention arm at a ratio of 1:1 via an interactive electronic response system hosted by the Nutrition and Health Technology Centre (CTNS) in Reus, Spain. The unit responsible for the randomisation took no further part in the study. Because the researchers know the names of the four high-schools, allocation concealment was not performed.*

We added a detailed intervention description in **Table 1** for the different high-schools included in the study; low socioeconomic level percentage, high-school size, public or private and geographic location.
were included. The high-school percentage of low socioeconomic level was defined using the percentage of low socioeconomic neighbourhoods defined by local authorities that feed into the high-school.

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<td></td>
</tr>
<tr>
<td>Control Group</td>
<td>The control group no received challenges to promote healthy lifestyles:</td>
<td>No intervention is assigned for this group.</td>
<td>High-school A Students from high schools from low-income neighbourhoods, who are 13 to 16 years of age: a) 2 to 5 ACCs b) 80-100 adolescents</td>
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Point 2. How did you prevent campaign “contamination” between the intervention and control schools? In other words, how did you ensure that the campaign information from an intervention school did not reach students in a control school?

Response 2. As the reviewer suggested, in social marketing interventions, avoiding “contamination” of the control group is difficult. For this reason, almost all the activities were performed inside the high-schools, and the lifestyles challenges announced on Facebook were reinforced in high-school classes to increase their interest. By contrast, the control schools did not receive any interventions inside the schools, and they were not invited in social event challenges related to the intervention around the city.

Point 3A. How was it decided to use five adolescents as the campaign creators in each country?

Response 3A. To standardize the process for the EYTO project, it was decided that every country would select 5 adolescents to serve as Adolescent Challenge Creators (ACCs) to create a solid group that was able to produce imaginative challenges. We improved the Methods, European Study Design section (pg 9, In 202): “The intervention should encourage healthy lifestyles among their peers of the same age in disadvantaged neighbourhoods; the adolescent peer-led model is more effective at achieving positive results in health behaviour than the adult-led models applied in school-based studies [Mellanby et al., 2000]. Adolescent peer-led interventions use the youth empowerment theory based on engaging young people in the decision-making process to improve their health and well-being [Morton & Montgomery, 2013].”

References:


**Point 3B.** How was it determined if the ACCs had leadership characteristics and were motivated and committed to the study?

**Response 3B.** We improved the Methods, Spanish study design section (pg 10, ln 231): “High-school teachers from the randomised intervention group selected the five adolescents according to their knowledge of the students by considering leadership characteristics and English level (because the students will participate in EYTO European meetings), 2 adolescents from one high-school and 3 from the other high-school.”

**Point 4.** The abstract mentioned that the ACCs received a 4 hour training session but it doesn’t seem that the methods section mentions this. Was one training session sufficient?

**Response 4.** To clarify what training sessions were provided, we improved the Abstract (pg 4, ln 91): “From the intervention group, 5 adolescents with leadership characteristics, called “Adolescent Challenge Creators” (ACCs) were recruited”, and (pg 4, ln 92): “These 5 ACCs received an initial 4 h training session about social marketing principles and healthy lifestyle theory, followed by 24 sessions (1.30 h/session) divided in two academic years to design and implement activities presented as challenges to encourage healthy lifestyles among their peers, the approximately 180-200 high-school students in the intervention group”, and the Methods, Spanish study design section (pg 10, ln 236): “The 5 ACCs received a 4 h initial training session about social marketing principles and the healthy lifestyle theory from a university specialist in health and communication. Moreover, the 5 ACCs received 1.30 h of training every week over 12 weeks (1st academic year) and 1.30 h of training every week over 12 weeks (2nd academic year), a total of 12 sessions/academic year, leading to a total of 24 sessions (1.30 h/session), also performed by a university specialist. The aims of the sessions were to train the 5 ACCs on health promotion, health education, communication and social media so that they could design the challenge activities for their peers. The university specialists educated the 5 ACCs about the primary and secondary objectives of the intervention, and the ACCs then had to design the challenges for their schoolmates to accomplish the defined objectives”.

**Point 5.** Sample size estimation: What are you considering as a “group”? Is it the two intervention high schools combined or each high school? You indicate (line 288) that a minimum of 121 adolescents were needed per group. Thus, are you combining both intervention groups of 100 to meet this estimation? If so, did you ensure that the high schools were similar enough to combine them?

**Response 5.** Each group was formed by two high-schools; two high-schools were part of the intervention group, and two high-schools were part of the control group. We required a minimum of 121 adolescents per group, where the groups are the intervention group (formed by 2 high-schools) and the control group (formed by 2 high-schools). We improved the following sentence in the Abstract (pg 4, ln 88): "which 2 high-schools were designated as the control group and 2 high-schools were designated as the intervention group, with a minimum of 121 schoolchildren per group”. Moreover, (pg 4, ln 92): “These 5 ACCs received an initial 4 h training session about social marketing principles and healthy lifestyle theory, followed by 24 sessions (1.30 h/session) divided in two academic years to design and implement activities presented as challenges to encourage healthy lifestyles among their peers, the approximately 180-200 high-school students in the intervention group.”

The high-schools were randomized at baseline, and it was assumed that the four high-schools had similar characteristics. Because of this, the high-schools could be combined to achieve a minimum of 121 schoolchildren per group (intervention group or control group).
Minor revisions

Point 6. Abstract, line 94: It is unclear from the abstract if 180-200 students were recruited from each high school or total although this is explained later in the methods.

Response 6. A total of 180-200 students were recruited per group (2 high-schools). We improved the Abstract (pg 4, In 92): “These 5 ACCs received an initial 4 h training session about social marketing principles and healthy lifestyle theory, followed by 24 sessions (1.30 h/session) divided in two academic years to design and implement activities presented as challenges to encourage healthy lifestyles among their peers, the approximately 180-200 high-school students in the intervention group.”

Point 7. Please add the campaign length in the abstract.

Response 7. As the reviewer recommended, we added the length of the intervention to the Abstract (pg 4, In 87): “In Spain, the research team decided to perform a cluster randomised controlled intervention over 2 academic years (2013-2015)”.

Methods section:

Point 8. Line 269: What are gymkhanas and scholar contests?

Response 8. We added the definitions of gymkhanas and scholar contests to the Methods, Intervention section (pg 12, In 299): “The ACCs designed and implemented the following challenges: gymkhanas (an activity inside high-schools in which adolescents were divided by teams and competed among themselves in different sport and food tasting competitions, such as goal scoring, racing, or discerning foods with one’s eyes closed) and cooking ability and lifestyle knowledge competitions (high-school cooking competition to prepare healthy dishes simulating cooking TV show or quiz show), as well as pop-up events that included healthy cooking contests and lifestyle knowledge competitions. The 5 ACCs had to be in touch with community stakeholders to obtain some resources free of charge. For example, Central Mercat de Reus gave them food to develop cooking competitions and run the gymkhana, and local government provided local community spaces to develop challenges. Moreover, material costs for items such as posters, flyers, etc. were paid for by the project budget.”

Point 9. Table 2: Are you able to provide more concrete examples of what is included within the campaign?

Response 9. We improved Table 2 using more concrete examples of how we achieved each social marketing criterion.

<table>
<thead>
<tr>
<th>Research group</th>
<th>Adolescent Challenge Creators (ACCs)</th>
<th>Research group and Adolescent Challenge Creators (ACCs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3. Customer Orientation: Focuses on the audience to help understand their lives, behaviours and issues.</td>
<td>4. Behaviour: Aims to change people's actual behaviours.</td>
<td>3. Theory: Uses behavioural theories to understand behaviour and to inform the intervention.</td>
</tr>
<tr>
<td>The peer-led model attracts the motivation of adolescents to participate and interact in the intervention, because adolescents prepare activities directed to adolescents. In this way, it has in mind</td>
<td>Aims to improve the consumption of fruits and vegetables, PA practice, and breakfast consumption and decrease the TV, PC and video game behaviour.</td>
<td>It used the behavioural change framework, taking into account the “Behaviour Change Wheel” (Michie, van Stralen, &amp; West, 2011).</td>
</tr>
<tr>
<td>Point</td>
<td>Revised Text</td>
<td></td>
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<td>-------</td>
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<td></td>
</tr>
<tr>
<td>10.</td>
<td>It seems that the writing tense is a combination of past, present and future. I would suggest being more consistent with verb tense as much as possible throughout. For instance, in some sections, it appears that the study is being proposed whereas in others, it seems that the study is completed.</td>
<td></td>
</tr>
<tr>
<td>Response 10.</td>
<td>We apologize for using multiple tenses. To improve the writing, we used past tense throughout the manuscript.</td>
<td></td>
</tr>
<tr>
<td>11.</td>
<td>Lines 292-293: This doesn’t seem to be a complete sentence.</td>
<td></td>
</tr>
<tr>
<td>Response 11.</td>
<td>We improved this sentence in the Methods, Statistical analysis plan section (pg 14, ln 332): “We planned the data entry, coding, security, and storage, including any related processes, to promote data quality (using double data entry via two investigators and range checks for data values).”</td>
<td></td>
</tr>
<tr>
<td>12.</td>
<td>Additional file 3: Enrollment is misspelled.</td>
<td></td>
</tr>
<tr>
<td>Response 12.</td>
<td>We have checked the spelling of this word, and “Enrollment” with a double l is the American spelling, whereas “Enrolment” with a single l is the British spelling. We did not correct the spelling because the manuscript is written in British English.</td>
<td></td>
</tr>
</tbody>
</table>
Point 13. The spacing between paragraphs is inconsistent or lacking at times.

Response 13. We checked the spacing between paragraphs.

Point 14. Fonts vary in certain places.

Response 14. We checked the font to ensure it is consistent.

Discretionary

Introduction

Point 15. Line 131: You used the term “poor” population but please be consistent with terminology—suggest using socioeconomically disadvantaged as you listed in other places.

Response 15. As the reviewer suggested, we changed the term “poor” to “socioeconomically disadvantaged” in the Background section (pg 6, ln 131): “obesity rates follow a social gradient in which the highest rates are present in racial/ethnic minorities and socioeconomically disadvantaged populations”.

Methods

Point 16. Having the study design as a figure is helpful (Additional File 3)—will this file be readily available to the reader?

Response 16. We changed the Additional File 3 to Table 4, according to the reviewer’s recommendation.

Point 17. Abbreviations were sometimes confusing or excessive. While a key is listed near the end, would suggest relying on them less often if possible.

Response 17. We reduced the abbreviations in the text. Currently, physical activity, obesity and social marketing are not abbreviated.