Author's response to reviews

Title: A meta-analysis of weight gain in first year university students: is Freshman 15 a myth?

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Author's response to reviews: see over
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Title: “A meta-analysis of weight gain in first year university students: is Freshman 15 a myth?”

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Author's response to reviews: see over
Dear editors,

We are very grateful for the feedback and have made several modifications to the manuscript. We have addressed all comments of reviewers required by the editor. We have also addressed the comments of reviewer 3 which were not highlighted by the editor. We have marked a star beside these.

For a few comments, we have explained why we would prefer not to make certain changes (mainly due to space or time constraint) but should the editors prefer, we can certainly make them.

We are confident the comments of the reviewers have made our manuscript stronger.
## Minor essential revisions

<table>
<thead>
<tr>
<th>Comment 1</th>
<th>Comment 37 from the first review: I still do recommend eliminating this point. It relies on an assumption that really cannot be evaluated from the available evidence and is speculative. For reference: Comment 37 was How do the authors know that 80% of the weight was gained during the first term? Did they assume that average weight gained in the first half was also gained by the same students that gained weight in the second half? What if students who gained weight in the first term decided to monitor their weight, and average weight gained in the second term was actually among different participants? This calculation does not seem appropriate given the available information.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Response 1</td>
<td>The goal of our analysis is to compare the mean of the first term weight gain to the first year weight gain to investigate whether weight gain happens more predominantly at the start of the year. Although we are unable to conclude that the same individuals gain weight in the first term and the rest of the year, these findings are important as they indicate that as a whole first year populations gain on average around 70% of their total first year weight gain in the first term. In addition this highlights an important area for future research as determining whether individuals gain weight more quickly in the first term can inform health promotion approaches and target individuals early on in their first year of university. As we believe this is an important point we would prefer to keep it in the manuscript and as such we have modified the paragraph to make clearer what we are able to determine from this finding. We have also expressed the limitations more clearly in the discussion. Should the editors prefer this to be removed, please inform us.</td>
</tr>
</tbody>
</table>

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### Results:

Six studies had two different time points of follow-up, with reported SD. In these studies over the first four months, students gained an average of 1.24kg (CI: 0.87–1.61, $I^2=81.6\%$) and by the end of the academic year, they had gained on average 1.76kg (CI: 1.32–2.21, $I^2=82.6\%$). When we conducted a meta-regression, the length of follow-up was significant ($p<0.05$) to predict higher weight change; the univariate $R^2$ was 27.1%.

### Discussion:

Weight gain in the first term was 1.24kg, only 0.5kg less than that for the first year.
in total (1.76kg). Although both figures come from pooled means, representing average overall weight gain for the samples, this could suggest that weight gain happens most predominately during the first term. No study allowed us to investigate whether the same individuals were gaining weight both during the first term and throughout the rest of the year, but these findings indicate that more than two thirds of the weight gain in first year populations happens early in their first university year. This is an important area for future research as if we were able to track weight change in individuals more confidentially, it could demonstrate whether this weight gain is non-linear and predominantly within the first 4 months as suggested from these findings, highlighting the importance of early prevention by universities. For effective health promotion efforts, further research should be conducted to evaluate individual level trends and explore this finding further.

Comment 2

Thank you for including Table 2.
- Please look it over for formatting, as some of the spacing between words seems shifted around, and is not aesthetically very appealing. "By measurement method" should specify that this is referring to body weight.
- P-value needs to specify what this is referring to...heterogeneity? the effect estimate being different from zero?
- "Location" could be "country" instead.
- "By weight gainers" should not be in this table, since it is not a meta-analysis like the others, but just a pooled mean.
- The row with the results weighted by sample size can be deleted since this is a sensitivity analysis that is not typically performed.
- Finally, the title should specify that this is a random effects meta-analysis.

Response 2

The following changes to table 2 have been done:
- Improved the spacing between words
- Changed ‘By measurement method’ to ‘by body weight measurement method’
- Changed ‘P-Value’ to ‘P-Value of heterogeneity’
- In table 1, location has been changed to countries
- Analysis by weight gainers has been deleted
- Analysis weighted on sample size has been deleted
The title has been changed to ‘Table 2: Summary of random-effects meta-analysis estimates by type of analysis’
**Reviewer 2:**

### Major compulsory revisions

<table>
<thead>
<tr>
<th>Comment</th>
<th>Response</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1</strong></td>
<td>Low publication bias was found in the meta-analysis and the “trim and fill” method could be used to show whether the result of original analysis is robust. Also, sensitivity analysis could be conducted to examine whether publication bias still exists when removing some particular studies. We have conducted this throughout the meta-analysis as we repeated analyses with and without certain studies. All analyses were similar and not significantly different and thus we had no reason to remove particular studies. We did not include this in the manuscript as we further believe we have strong inclusion criteria thus removing the necessity to exclude articles. Should the editors want a new section on this to be included, we can. Unfortunately this will require an extension on the time allotted for revisions.</td>
</tr>
<tr>
<td><strong>2</strong></td>
<td>The heterogeneity of this meta-analysis was high and the author suggested that it could be attributed to sample size and duration of follow-up. However, several stratified analyses including stratifying by study length were conducted but heterogeneity remained high in each of the sub-groups. The reason of the high heterogeneity is still unclear and the author could further stratify the studies by sample size if that might be the source of heterogeneity. We further conducted analyses stratified by sample size and this had a small impact on the heterogeneity. I have modified the sentence to explain further reasons behind the high heterogeneity.</td>
</tr>
<tr>
<td><strong>3</strong></td>
<td>The second author should conduct the entire screening independently and then the results should be compared with those from the first author. Whereas in current study only a small fraction of studies were screened by the second author. The second author designed and pilot tested the search strategy with the first author and thus we felt confident of the reliability of having the second author screen 10% of the sample and 5% of the excluded for each stage (title, abstract, full articles). In order to avoid this article to become obsolete, we feel that a re-screening of the studies would significantly delay the publication. Should the editors feel that this is important, we can do this with a few months extension for revisions.</td>
</tr>
</tbody>
</table>

**Reads now**

The large differences in sample size and in differences in length of follow-up did contribute to heterogeneity. It is to note, that the studies had different gender composition and were conducted in different countries, which likely adds to the heterogeneity.
Minor essential revisions

**Comment 1**
More details of the study flow should be depicted in Figure 1, showing numbers of studies being excluded in title and abstract screening stage as well as full-text review stage due to different inclusion criteria.

**Response 1**
Figure 1 has been modified to include the numbers for title and abstract screening. We feel that including numbers for each exclusion criteria would make the figure much bigger and slightly more complicated as several articles were excluded for more than one reason. The goal of this figure is for it to be easy to read and to easily follow the selection steps. Adding several boxes and arrows would definitely make it hard to quickly interpret. If after these changes the editors still wish to include numbers for each inclusion criteria, we can modify it.

**Comment 2**
More primary characteristics, including percentage of men, baseline BMI, age, retention rate, study design, of the included studies should be shown in Table 1.

**Response 2**
We agree it would be useful to include all of this. Unfortunately not enough studies provided the complete information to include in this table. For example, several studies included baseline BMI for the initial sample they obtained but did not provide the initial BMI for only those who completed the study. They present...
a cross-sectional age and baseline BMI.

<table>
<thead>
<tr>
<th>Comment 3</th>
<th>For studies with missing SDs for measurements of weights, the author should mention how exactly SDs/SEs were imputed.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Response 3</td>
<td>We have significantly revised this to include the formula Imputation of SE was done using a correlation coefficient, as detailed in the Cochrane Handbook for Systematic Reviews of Interventions section 16.1.3.2(2) [57]. The SE imputation formula is based on obtaining the root-square of the $SD^2$ of the baseline weight + $SD^2$ of final weight − (2<em>SD of baseline weight</em> correlation factor). As detailed in the section 16.1.3.2(2), a correlation factor can be obtained for each study with SEs. These were calculated and the mean was used as the overall correlation factor.</td>
</tr>
</tbody>
</table>
Reviewer 3:
We were asked to address comments 1,2,3,4,6 of major compulsory changes. We have also address all the other comments and those are marked as a * as they were not specifically requested to be answered.

**Major Compulsory Changes:**

<table>
<thead>
<tr>
<th>Comment 1</th>
<th>Were there any language restrictions for study selection? Either way, this [Comment seems to be broken off]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Response 1</td>
<td>We did not have language restriction and we have included a sentence about this under the eligibility criteria</td>
</tr>
<tr>
<td>Reads now</td>
<td>We had no language restriction.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Comment 2</th>
<th>How was missing data handled? Include a description in the manuscript. List how many studies were missing data and were not used in the analysis in the results section of the manuscript.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Response 2</td>
<td>We have included more information under the method section and have modified the result section.</td>
</tr>
</tbody>
</table>
| Reads now | **In the method section:** We initially dealt with missing data by contacting authors. Studies in which standard errors were not available after contacting relevant authors were imputed when possible and an imputed analysis was performed and compared to studies presenting standard errors. [.....] Studies with key missing data other than SE and for which we did not get an author response, were excluded from specific subgroup analyses (Table 1).  

**In result section:** Ten of these studies were missing standard error for the main meta-analysis and therefore were only in some subgroup analysis (Table 1).  

**In result section – for the imputed SE analysis** Seven studies could not be included in the meta-analysis of mean weight change as they did not report a standard error and we were unable to obtain the missing data from authors. |

<table>
<thead>
<tr>
<th>Comment 3</th>
<th>Include quality assessments for each study in Table 1.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Response 3</td>
<td>A column for the quality assessment on a total score of seven has been added to table 1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Comment 4</th>
<th>In the discussion section, explain why (e.g. new independence, stress, restricted sleep) we think we’re observing weight gain.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Response 4</td>
<td>Unfortunately, this paper did not focus on exploring the root causes for weight gain. We have included in the discussion a line referring to reviews which have</td>
</tr>
</tbody>
</table>
Read now, our meta-analysis confirmed that the weight in university students increased statistically. A weight gain of 1.4kg over two terms is meaningful and represents an increase in weight five times higher than in the general population over a year [15]. Some reviews [4, 5] have linked this weight gain to stress, alcohol drinking, unhealthy eating and poor physical activity.

**Comment 5**
List lack of ethnic diversity and study duration as limitations.

**Response 5**
Unfortunately not enough studies commented on included data on ethnicity. We have included the lack of information on ethnic diversity in the discussion, in the paragraph where I discuss limitations.

Read now, in terms of limitation, we did not have enough data to account for baseline BMIs and ethnic make-up which limits the generalizability of the results.

**Comment 6**
Figure 1 needs to be better illustrated.

**Response 6**
We have brought many changes to this figure including change records to studies, changing the arrows and including categories for title, abstract and full paper reviewing.

We feel that including numbers for each exclusion criteria would make the figure much bigger and slightly more complicated as several articles were excluded for more than one reason. The goal of this figure is for it to be easy to read and to easily follow the selection steps. Adding several boxes and arrows would definitely make it hard to quickly interpret. If after these changes the editors still which to include numbers for each inclusion criteria, we can modify it.
**Minor points**

| Comment 1* | Minor points: The manuscript could be better written in general. 1. The authors actions should be described in past tense (e.g. Our study aimed to...) |
| Response 1 | We have rectified this and all actions are now in past tense. |

| Comment 2* | There needs to be more detail added to the abstract. 1. Add one sentence regarding the public health importance to the background section of the abstract. a. “Given adolescent weight gain is highly linked to overweight and obesity in adults,...” 2. “Our metaanalysis aims at updating the literature” should be replaced with “aimed to update the literature.” 3. Provide some examples of the databases used. 4. Add average length (number of months) of studies 5. Include subgroup results to the abstract results section 6. “It is clear that across the globe” is far reaching as these studies were conducting in a limited number of regions. 7. “Done in a systematic way” is colloquial. I would rather read the systematic approach than to be told that it was systematic. 8. Attempt to add the average quality of the studies to the abstract |
| Response 2 | We have changed several aspects of the abstract |
Given adolescent weight gain is highly linked to overweight and obesity in adults, a better understanding of adolescent student weight gain is crucial if we are to combat the rising adult obesity prevalence. This meta-analysis aimed to update our understanding of adolescent weight gain. We conducted a search on six standard electronic databases (covering PubMed, Embase, PsycInfo) from 1980 to 2014. The overall pooled mean weight gain was 1.36 kg (3 lbs) (95% CI: 1.15 - 1.57) over an average of 5 months. Due to limited space, we would prefer not to include further subgroup results. Despite most universities having some health promotion policies, we denote a consistent weight gain in university students across several countries. The quality of papers was assessed and data extraction was done with a systematic approach.

**Comment 3**: In the introduction, “teenage” should be replaced with “adolescent.”

**Response 3**: This has been changed.

Adolescent obesity in particular has been shown to be a growing problem. For example, in the United States, obesity in 12–19 years old has increased dramatically in the past decades with about 35% being overweight or obese in 2011 (3). In those late adolescent years and early adulthood, transition from secondary school to university is a critical and vulnerable period for body weight changes and unhealthy lifestyle adoption (4-6).

**Comment 4**: In the introduction, “battle” seems to colloquial to me.

**Response 4**: Battle has been changed to curb.

As obesity has reached the level of epidemic proportions according to the World Health Organization, with an approximate number of 1.4 billion worldwide overweight and 300 million persons clinically obese [1], governments and health organizations are trying to combine efforts to curb this uprising risk factor for cardiac, endocrine and cancer diseases.

**Comment 5**: Provide a reference for the Ottawa-NewCastle scale the first time it is mentioned.

**Response 5**: The citation has been included.

<table>
<thead>
<tr>
<th>Comment 6*</th>
<th>Under the ‘analyses by quality of study’ subheading, “we used OwattaNewcastle scale to evaluate the quality of studies of all 32 studies meeting the inclusion criteria”….should be included in the methods section (and not results section) of the manuscript</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Response 6</strong></td>
<td>This sentence under the subheading has been deleted. We also slightly modified the methods section to make it clearer we used the scale for each study</td>
</tr>
<tr>
<td><strong>Reads now</strong></td>
<td>We assessed the quality of each study using a modified version of the Ottawa-NewCastle Scale[57]. Studies were assessed on a total score of seven on i) the representativeness of the cohort and recruitment method, ii) the outcome assessment (measurement method, time of first measurement, length of follow-up and retention rate), and iii) bias analyses conducted. Studies with scores of six and above were deemed high quality, between four and five were average quality and below four, poor quality.</td>
</tr>
</tbody>
</table>
| **Comment 7*** | - The section labeled “Heterogeneity and bias analysis” should be listed before the subgroup descriptions.  
- Under this subheading, replace “we also analyzed a publication bias...” with “we also analyzed the potential for publication bias...” |
| **Response 7** | The heading “Heterogeneity and bias analysis” has been moved upwards, above all subgroup analyses.  
The recommended sentence change was also adopted to read “We also analysed the potential for publication bias through” |
| **Comment 8*** | In Table 1, consider adding the standard deviations to the “mean weight gain (kg)” and “mean weight gain in weight gainers” columns. |
| **Response 8** | We have included SD in the table. |
| **Considerations:** |  |
| **Comment 1*** | The title should be edited. Perhaps, “A metaanalysis of weight gain in first year university students: is Freshman 15 a myth?” |
| **Response 1** | We have made the change to the title, we appreciate this suggestion |
| **Comment 2*** | - Instead of claiming that some studies were excluded because of “poor” data reporting, it would be better to describe it as “less comprehensive” data reporting.  
- Consider citing the studies that were excluded |
| **Response 2** | - We have made the change from poor data reporting to less comprehensive data reporting.  
- Under the result section, I have also made it clearer where we cite the excluded article |
| **Reads** | - We had to exclude a number of studies due to less comprehensive data |
now reporting or cross-sectional nature
- We thus excluded a few studies on these bases[9, 12, 16, 23-27, 35, 36, 47] and we were careful not to include duplicates