Author's response to reviews

Title: Primary weight maintenance: An observational study exploring candidate variables for intervention

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Version: 2 Date: 12 June 2013

Author's response to reviews: see over
Dear Editor in Chief:
Thank you for the insightful comments from the reviewers. We have made all of the suggested changes and believe that they have improved the manuscript. Please find enclosed the revised version entitled “Primary weight maintenance: An observational study exploring candidate variables for intervention”. This paper reports on the relatively new and unexplored concept of primary weight maintenance (PWM) i.e. preventing weight gain among normal weight or overweight individuals.

The report comprises original research findings that have not been published elsewhere. We believe it would be suitable for consideration for publication in Nutrition Journal as it follows one of the journal’s aims: “The journal aims to encourage scientists and physicians of all fields to publish results that challenge current models, tenets or dogmas”. The revised manuscript has been read and approved by all of the authors. There are no conflicts of interest and the requirements for authorship have been met.

The following pages contain a point by point response to all of the comments and suggestions made by the reviewers. The reviewer comment is written in black text. This is followed by a response in red. Actual changes to the manuscript itself are shown in blue text. Sometimes the re-written blue text appears within an entire section in order to provide a context.

Sincerely,

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Reviewer's report
Title: Primary weight maintenance: An observational study exploring candidate variables for intervention
Version: 1 Date: 18 September 2012
Reviewer: Makiko Nakade

Reviewer's report:
The present study focused on primary weight maintenance and examined factors related to it. The idea is very interesting but there are some questions about the study;

Major Compulsory Revisions
1) In the study, the subject age was more than 30 years old. Some women become pregnant and give birth during 10 years and this may affect weight change. If it was not considered in the study, examination only focused on non-pregnant women during 10 years may be needed.

The exclusion of certain data for women who were pregnant at either the baseline or ten-year follow-up points was explained with the addition of the following text to page 8:

Finally, there were two questions where the subject indicated their body size, at both baseline and ten-year follow-up, using a nine point scale. Responses from women who stated that they were pregnant at either of these two time points were set equal to missing.

As no other data on pregnancy were gathered, there were no other exclusions possible.

2) The variables shown in table 1, table 2 and table 4 create a little confusion. In table 1, numbers of independently significant variables are shown. In table 2, numbers of variables significantly related to ideal type are shown. In table 4, significant variables are shown. Are these variables mean the same variables? If not, please add more information about the variables.

The titles of tables 2 and 4 have been modified to clarify their contents. As is now stated in the title for table 2, the variables shown are those that are significantly related to PWM classified according to assignment to ideal types.

Quality of written English: Acceptable
Statistical review: No, the manuscript does not need to be seen by a statistician.
Declaration of competing interests:
I declare that I have no competing interests
Reviewer's report
Title: Primary weight maintenance: An observational study exploring candidate variables for intervention
Version: 1 Date: 21 April 2013
Reviewer: Pedro Teixeira

Reviewer's report:
This paper analyzes a very large number of individual questions as potential correlates of 10-year natural weight changes in a large Swedish cohort. The goal was stated as aiming to study primary weight maintenance (PWM), an interesting concept. I have some questions and concerns regarding this study and how it is presented.

A central limitation in this paper is the questionnaire used. It apparently consists of “31 questions” and “166 predictors” (items?) but readers are not informed as to how exactly these questions were selected and whether they were subject to any factorial treatment or psychometric analysis. Besides some questions fitting into a few “ideal types” (apparently merely on qualitative data, which is not clearly explained), there is no more information as to any systematic attempt to organize the items into dimensions, eliminate redundant items, test validity and reliability of factors, etc. As a result, items are treated as individual variables, resulting in an extremely difficult, and largely meaningless, exercise when authors have to interpret results. This is made worse by the various weight/age/gender groups used to split the analysis. The authors end up spending a lot of time analyzing the data “quantitatively” (x number of predictors were significant for this group and Y number for that – e.g. Table 1, 2, 5, 6 provide information of quite limited inferential value) which is of limited use. The risk of type I error or chance significant findings is also large is such an analysis.

One recommendation is that authors make an a priori attempt to organize the 166 items into meaningful categories by using factor analysis or other data-based method, before they perform any data analysis of a predictive nature regarding outcomes. I think they should start with simple correlation analysis between discrete dimensions/variable and weight change and move on from there.

It was the intention of the authors at the outset of the study to reduce the number of variables involved using a combination of factor and item analyses. As is now explained in the methods, results and discussion, neither of these approaches had a satisfactory result. In fact, more than anything, if was these analyses that convinced us that there is a distinctly different pattern of predictors within each group. As the analyses progressed, it became clear that the most important aspect of the report was to emphasize this difference as a rationale for why interventions may have to be tailored to specific demographic groups.

In order to clarify that we did explore these possibilities, the following sections have been added (in blue text):
In the methods section on page 9:

**Item analysis and factor analysis**

One goal of the study was to reduce the number of variables under consideration. Two separate avenues were pursued to accomplish this. First, the correlation between survey variables was examined with the intention of eliminating one member of any pair with a correlation between them of 0.95 or higher. This did not lead to the elimination of a single variable.

The second analytic attempt at dimension reduction employed factor analysis. Specifically, a confirmatory factor analysis to identify the eleven ideal types was performed using principal factor extraction and varimax rotation of basis vectors. These analyses were conducted separately for men and women. Neither the scree plot of the Eigenvalues, nor the pattern of factor loadings, indicated the presence of these eleven ideal types. A second analysis based on an a-priori identification of six factors also did not produce a satisfactory mathematical solution. Therefore, rather than using eleven or six principle components in subsequent analyses, the study retained the original set of 166 survey variables for use in the prediction of PWM.

**Prediction of PWM**

Four analytic steps were conducted to identify variables that were predictive of PWM. First, a one by three ANOVA was used within each of the twelve subgroups to compare mean percent weight change across the three levels of the collapsed Likert scale responses. In certain limited cases where further collapsing into only two levels was required, this resulted in a t-test. In addition, Pearson correlations between these three response levels and percent weight change were calculated. If the significance test for either the ANOVA or the correlation was significant at $p \leq .10$ the variable was retained for the next step of the analyses. The number of significant variables identified by these analyses was summarized for each subgroup in tabular form.

In the results on page 12 and 13:

**Item analysis and checks for redundancy**

For the 166 variables considered, there was no correlation between any two higher than 0.64 for women and 0.56 for men. Therefore, as stated above, this analysis did not lead to the elimination of any variables.

**Factor analysis**

For the factor analysis that sought to confirm the presence of the eleven ideal types, the scree plot of the Eigenvalues did not show a noticeable break at the eleventh value for either males or females. The proportion of total variance explained by the first eleven factors was 41.9% and 41.2% for men and women respectively. There was no discernible pattern in the factor loadings that suggested the presence of the eleven ideal types.

Results for the six-factor solution were equally unsatisfactory. For both genders less than 25% (22.8% for men, 21.7% for women) of the variance was explained for either six-factor solution. Neither the scree plot of the Eigenvalues nor the pattern of factor loadings gave support to the presence of six factors to explain the variance in the system of variables.
In the discussion on page 17:

This conclusion was also supported by the results of the factor analyses.

Another intention was to reduce the number of subgroups under consideration from 12 to a smaller number by combining age and/or BMI groups. The following additions were made to the methods and results sections to explain this:

In the methods section on page 10:

At this point, an attempt was made to combine subgroups together based on a similar pattern of significant predictors of PWM. This involved the creation of frequency tables that showed how many of the twelve subgroups (six for each sex) the variable was significant in. Further, the subgroups were examined visually to attempt to identify those that had the same set of significant predictors. For reasons that will be clarified in the results section, it was immediately apparent upon visual inspection that combining subgroups was not appropriate. This required that the analyses continue stratified by all twelve groups.

In the results section on page 16:

**Patterns for variables significant in half or more of the subgroups**

Table 5 tabulates how many subgroups each of the 166 variables was significant in for each sex. As shown, of the variables that were significant, the vast majority (90.4% for women and 87.3% for men) were significant in less than half of the subgroups. Taken across both sexes combined, of the 152 variables that were significant in at least one subgroup, only 7 of these (4.6%) were significant in 6 subgroups or more (data not shown). As may be surmised, as a consequence of this, the variables that were significantly predictive of weight change differed widely between groups with no two groups having the same set of predictors. It was this result that led the investigators to conclude that combining either BMI or age subgroups would obscure this important aspect of the data.

Another recommendation (especially if the previous recommendation is not followed) is to reduce the number of covariates and categories and merely adjust for some of them (e.g. age and initial weight) in regression analysis (especially when they appear to change the relation between the predictor and the outcome). If these covariates prove to change the nature of the associations between predictors and weight change, then consideration can be given to using separate categories.

As described above, we chose to address this concern of the reviewer using factor analysis rather than a regression approach.

This appears to be a retrospective study, i.e., the predictors were assessed after the weight change, which is a major limitation due to the potential for reverse causality. This should be acknowledged in the paper (if this is correct) and its implications thoroughly discussed.

The issue of reverse causality has been addressed with the addition of the following text in the discussion on page 18:

When designing an intervention, it must be born in mind that this study has only identified variables that are related to PWM, and has not established any causal connections, which can
only be done in a randomized intervention. It is also important to note that a study of this type is vulnerable to the issue of reverse causality. Thus, when two variables have a causal connection, the issue of which was the cause of the other could also only be clarified in a prospective trial. Finally, even if causal connections were established, a variable would only be useful in an intervention if it was something that the individual or society could control.

Although this is not mentioned in the study aim, it appears that a key goal of the study was to assess the validity of a priori “ideal types” for PWM (e.g. see initial paragraph in Discussion). This should be made clear earlier in the paper.

This has been emphasized with the addition of the following to the Aims section on page 5:

To quantitatively validate the existence of the eleven ideal types that were previously identified in a qualitative study.

The Discussion section could be better organized.

The discussion has been reorganized as explained below.

In addition, there are instances when results are interpreted in inaccurate ways. For instance, in the bottom paragraph of page 14, the different number of significant predictors for men and women should not, in my view, be interpreted as evidence that women find it more or less difficult to lose weight. Easiness to predict weight loss and easiness to lose weight are two different questions which may or may not be related.

This has been acknowledged with the modification of the following sentences in the discussion on page 17:

The findings of a higher number of significant predictors and higher R-squared values for men may suggest that weight maintenance may be a more complex issue for women than men. Among the issues faced by women are having lower caloric requirements than men yet being served the same portion sizes by restaurants [36].

In my view, the authors are excessively concerned with translating their findings into intervention-relevant information. Considering the study’s limitations (e.g. retrospective study) and its very descriptive nature, authors might limit themselves to describe associations and possible implications to understand the natural course of obesity and weight maintenance, a sufficiently worth goal considering how little evidence exists.

The emphasis that the paper had placed on the potential for intervention has been reduced (removing approximately one page of text). The only reference to intervention possibilities is now included in the following paragraph in the discussion on page 18:

Before planning an intervention, there are several decisions an investigator would be faced with, the initial being which subgroups to intervene on. One logical approach would be to begin with those subgroups where the greatest degree of the phenomena is explained by modifiable variables (the age/sex- and BMI-strata with the highest R-squared) (table 4).
significant predictors of PWM within these subgroups would then be evaluated for their potential for having causal effects.

There is a large literature on predictors of weight control (e.g. systematic reviews by Elfhag et al and by Teixeira et al., in Obesity Reviews; data from the US National Weight Control Registry), which is ignored but could be informative. Generally, many of the references cited in the paper are old and I wondered whether the authors have a firm grasp of the obesity literature.

We have now added more information on predictors of weight control. These studies describe factors of importance for secondary weight maintenance. Both articles by Elfhag et al and by Teixeira et al have been referred to in this section. This is done in the background section on page 3:

Weight maintenance has been defined as a person's ability to maintain their weight within ± 3% of a baseline value over a defined time period [22]. Previous studies on weight maintenance have most often focused on secondary weight maintenance (SWM), i.e. maintaining a reduced weight following weight loss. Two central factors known to be important for SWM are regular physical activity and healthy eating habits [23-27]. Other factors that have been identified include having an accurate self-image [25], a high self-esteem [24], a positive body image [28], consciousness of one’s own behaviour [27], positive self-talk [29] taking responsibility for one’s actions [27], and the ability to cope with stress and confront problems directly [23, 27]. Further, successful secondary weight maintainers monitored weight fluctuations and had a clear alarm signal for weight gain that triggered immediate action [30]. They also had clear strategies for coping with lifestyle interruptions. When compared with re-gainers, maintainers more often continued to use the strategies they had acquired during weight loss [29]. In addition, a study on mediators of weight loss and weight loss maintenance showed that lowering emotional eating and adopting a flexible dietary restraint pattern were critical for sustaining weight loss [31].

The wide dispersion of predictors of weight control, and possible implications for intervention, have also been noted on page 17 in the discussion:

In addition to the pattern of significant predictors representing a wide dispersion of ideal types, it was also observed that there was a great disparity in these predictors between subgroups. This implies that a future intervention has to be tailored based on age, sex and BMI. This approach has been suggested in an article summarizing lifestyle recommendations to prevent weight gain and achieve weight loss among children and teenagers [40]. It has also been suggested that this tailored approach would be beneficial for the treatment of obesity and SWM [41]. Further, for reasons explained above, an intervention could not be centered on the concept of an ideal type.

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