**Author's response to reviews**

**Title:** Perceived Body Image in Men and Women with Type 2 Diabetes Mellitus: Correlation of Body Mass Index with the Figure Rating Scale

**Authors:**

Harold E Bays (hbaysmd@aol.com)  
Debbra D Bazata (debbazata@hotmail.com)  
Kathleen M Fox (kathyfox@comcast.net)  
Susan Grandy (susan.grandy@astrazeneca.com)  
James R Gavin III (jrgavin3@yahoo.com)

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**Author's response to reviews:** see over
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Re: MS#7287453032765582 – Perceived Body Image in Men and Women with Type 2 Diabetes Mellitus: Correlation of Body mass Index with the Figure Rating Scale

Nutrition Journal Editorial Team:

Thank you for the opportunity to revise our manuscript after the peer review. We thank the reviewers for their comments and recommendations; they have enabled us to strengthen and clarify the manuscript. We have revised the manuscript in accord with the reviewers’ comments and provide a detailed explanation below of how the manuscript has been revised and how we have addressed each of the reviewers’ comments. We look forward to hearing from you regarding the revised manuscript.

Reviewer #1: Michael Davidson

There were no recommendations for modification from this reviewer.

Reviewer #2: Tiffany Cox

1. General: The research question is not clearly defined. The description of the study objectives and the results vary between “body image in individuals with various levels of BMI,” body image by T2DM status, and body image by gender. Though there is potentially useful information in any of these 3 questions, the intended question of this particular study is not clearly defined, thus making the logic, study design, and results difficult to follow.

RESPONSE: The study objective has been added at the end of the Introduction (page 5). The study focuses on estimating the correlation between the FRS and BMI among individuals with and without T2DM. We apologize that the objective was not clearly defined in the original manuscript. Perception of body image is presented separately for men and women since the FRS has different figures for each gender.

2. Introduction General: Additional review of the literature and organization would help strengthen the case for why this study is important. Also, a clear statement
of the research question/objective would help to set the framework for the rest of the paper.

RESPONSE: Additional information and references have been added to the Introduction (pages 4-5) to explain the importance of this study among T2DM. Also, a clear statement of the study objective has been added at the end of the Introduction (page 5).

3. Introduction Para 2 Sentence 3: There are actually several studies that look at this relationship. A quick PubMed search retrieved several studies including Baptiste-Roberts et al. 2006 Perceived body image among African-Americans with type 2 diabetes and Charles, Britt, and Know 2006 Patient perception of their weight, attempts to lose weight and their diabetes status.

RESPONSE: Additional information has been added to the Introduction (pages 4-5) with specific reference of the 2 studies that reviewer mentioned. We have conducted several PubMed searches in preparation of the original manuscript and have not found a study similar in approach to ours. With the clarifying of the study objectives (correlation between FRS and BMI among individuals with and without T2DM), we hope that the reviewer will see that these 2 references, in particular, address different research questions. The Baptiste-Roberts study compared desired versus current image and body image for the opposite sex. The Charles study compared self-reported weight to BMI, not their perceived body image and found more obese individuals with T2DM (did not study individuals with T2DM).

4. Methods Para 2 General: The methods described highlight several potential issues that are not addressed in the methods sections or the discussion of limitations including potential biases of mailing surveys (selection bias), a single informant for up to 4 household adults (response/recall bias), low response rate (possible impact on internal and/or external validity), up to 4 participants per household (cluster/correlation issues that should be addressed in statistical analysis using one of several methods such as GEE or multi-level modeling). Also, much more detail should be provided about how the “selected individuals” were selected to complete the baseline survey. Please clearly provide the criteria of how they were selected and some data showing how they compared to the larger study sample.

RESPONSE: We apologize that key information on the survey process was not included in the original manuscript. We had anticipated that readers would refer to the 2 key SHIELD references for a complete description of the survey approach. More detail
has been added to the Methods (page 6) that clarifies the issues that the reviewer raises. Even though the SHIELD surveys are mailed, the response rate has been 70% or greater and was 75% for the 2006 survey which was used for the present study. Additionally, selection bias has been specifically mentioned in the Discussion of study limitations (page 9). The issue of response/recall bias and cluster/correlation issues are not applicable because a single informant was used only for the screening survey to identify potential recipients of the baseline survey and members from the same household in the SHIELD survey are less than 1%. Furthermore, recipients of the baseline survey were randomly selected from representative groups of individuals with type 1 diabetes, type 2 diabetes and those with and without risk factors for diabetes; this information has been added to the Methods section (page 6).

5. Methods Para 3 General: Please provide specifically how the question was asked about T2DM status. Age of onset >21 is potentially problematic given the emergence of T2DM in adolescents. Please discuss why this was chosen and its potential impact. The categories as described in the current form are not all inclusive or mutually exclusive. For example, if a woman had gestational diabetes, she does not meet the criteria for “no diabetes mellitus”, but she doesn’t meet the criteria for “T2DM” either. How was she classified? Or if one was diagnosed with T2DM at age 20, how was he classified?

RESPONSE: Clarifying information has been added to this paragraph on page 6. The specific question asked to determine T2DM status has been added (have you ever been told by a doctor, nurse, or health professional that you have diabetes). The reason for the age >21 years for T2DM has been added and the impact is small since only respondents between age 18 and 21 had the potential for misclassification and there are very few respondents in this age group. Information on exclusions has been added to indicate that respondents with gestational diabetes or type 1 diabetes were excluded from the analysis.

6. Methods Statistical analyses: Several points in the statistical analyses do not seem consistent with the research question or appropriate to obtain valid results. In general, this is a very complex measure with variables that are likely highly correlated and at the very least clustered participants. More thorough and sophisticated analysis would likely be helpful to obtain increase confidence in the results.

RESPONSE: We apologize for the confusion surrounding the survey approach and statistical analyses. As mentioned in item # 4, clustered participants were not used in
the SHIELD baseline and annual surveys so GEE modeling is not warranted. Respondents were randomly selected from the respective disease groups which were nationally representative. A single informant was used only in the screening survey to identify adults within the household with specific health conditions; individuals from different households were then invited to participate in the baseline and annual surveys. We utilize a statistician in all our analyses and would have employed more sophisticated analysis if warranted.

7. Please justify why Pearson correlation was used instead of Spearman which may be more appropriate for this data which seems to be rank data. What kind of t-test was done and what mean differences were compared (sentence 2)? Further, if median BMI was compared rather than mean BMI, Mann-Whitney test would be appropriate for comparing medians as opposed to t-test.

RESPONSE: We appreciate the reviewer highlighting the need for Spearman correlations. Spearman correlations have been computed and replace the Pearson correlation coefficients on page 9 and in Figure 2. The Spearman correlation coefficients were similar but slightly higher than the Pearson correlation coefficients. Student’s t-tests were computed and this information has been added to the Statistical analysis section on page 7. Mean BMI differences were compared and this is now stated in the Statistical analysis section (page 7). Median BMI for each figure has been replaced with the mean BMI in Figure 1; thus means are used consistently throughout the manuscript.

8. Results General: There is no reporting of any overall relationships, only stratified by figures. Please provide overall results. Also, the differences in sample sizes across groups in the different strata make it difficult to make legitimate across group comparisons.

RESPONSE: We are not clear on what the reviewer is asking for in overall results. We believe that the clarity added to the Introduction and Methods sections regarding the study objective has alleviated the concern about overall results. Table 1 provides the mean BMI for T2DM and No DM groups. We believe it is outside of the scope of this project to provide BMI and FRS data for the entire SHIELD population (T2DM + no DM etc.) since it was not the objective of this study.

The median BMI was provided in Figure 1 to assist readers in interpreting differences between strata of different sizes. Additionally, the Student’s t-tests were computed on mean (SD) BMI and correlation coefficients were computed and both calculations take
into account the sample size of the groups compared. The strata sizes are large for each FRS figure except for the lowest 2 figures for women.

9. Results Para 2 Sentence 1: “Based upon their mean BMI, …” Please clarify what this means. Was the mean or median BMI deemed to be the most appropriate representation? Whichever it was should be used and reported consistently.

RESPONSE: The mean BMI was deemed most appropriate to report and Figure 1 has been changed to show the mean and standard deviation for each figure. The mean BMI is now reported consistently throughout the manuscript.

10. Discussion Para 3 Sentence 5: “no adjustments were made for these parameters in this analysis.” Why not? If the data is available, the analysis and validity of results would be greatly strengthened by including these covariates in the analysis.

RESPONSE: We have added an explanation in the Discussion section (page 10) as to why it was not necessary to adjust for these covariates. The study population was largely Caucasian and estimates for minorities would have been unstable. All respondents were from the United States so data from different countries could not be provided. Data on psychological profiles were not collected in the SHIELD study. Data were provided separately for men and women since this is the most influential covariate.

11. Discussion Para 5 Sentence 2 and 3: Please see Bulik et al 2001, Relating body mass index to figural stimuli: population-based normative data for Caucasians. This paper provides the results of 30,000 participants used to develop BMI norms for the Stunkard FRS. Please clarify how this differs from what is proposed as a major finding of this study.

RESPONSE: We appreciate the reviewer bringing this important article to our attention. We had conducted several literature searches and did not locate this article. The sentences mentioned by the reviewer (page 11) have been modified to indicate that this is the best body image and BMI data available for individuals with T2DM. We have also added information regarding the Bulik study and how Bulik’s study population (twins and related family members from Virginia) differs from the SHIELD population (unrelated individuals from across the US).
12. Discussion Para 6 Sentence 1: not supported by the research findings of this study.

RESPONSE: This sentence on page 11 has been revised to clarify our intention that there are discrepancies in body image among individuals with T2DM.

13. Discussion Para 6 General: Much of this paragraph is not supported by findings of this research study. Further determinations seem speculative and should be supported by references or acknowledged as only speculation.

RESPONSE: This information is now acknowledged as speculation on page 12.

14. Conclusion Sentence 1: This was not tested or shown in the data.

RESPONSE: This sentence on page 13 has been revised to clarify the overall findings.

15. Conclusion Sentence 4: How is this conclusion supported by this research study? If it were possible to make the T2DM individuals have a body image perception like non-diabetics, this does not mean that it would lead to weight reduction. Even in this data set, though the non-diabetics seemed to have a “more positive body image” they were still overweight/obese. Thus, this body image does not necessarily lead to achieving a healthy/normal body weight.

RESPONSE: This sentence on page 13 has been revised and clarified to indicate that it would assist clinicians in discussing and implementing weight reduction with their patients if body image perception was closer to their actual BMI. If patients perceived themselves as being overweight or obese then they might be more amenable to weight reduction.

Minor Essential Revisions:

16. General: Throughout the paper it is important to clearly define terms related to body image and be consistent in the usage. In short, body image is commonly thought of as one’s feelings about their appearance. However, in this paper, body image is frequently used to refer to the actual figure chosen by an individual. While this is not technically incorrect, it can be confusing. I would suggest that “figure” is used rather than “image” when referring to the Stunkard FRS responses.
RESPONSE: We have changed “image” to “figure” throughout the manuscript whenever the term refers to the Stunkard FRS response. We appreciate the reviewer pointing out the confusion.

17. Abstract Background Sentence 4: “Subjective perceptions” – Please clarify whether this is self-perception, perception of others, or both.
RESPONSE: This sentence in the abstract has been clarified to indicate self-perception.

18. Abstract Methods Sentence 4: Please state what kind of t-test was conducted and what mean differences were compared.
RESPONSE: This sentence in the abstract has been modified to state that Student’s t-tests were conducted and that mean BMI differences were compared.

19. Introduction Para 1 Sentence 3: needs a reference
RESPONSE: This sentence has been modified on page 4 to indicate that both measurements are useful. There are numerous references for BMI and disease but we feel that listing them here is not relevant to the study.

20. Methods Para 1 Sentence 1: “A cohort of individuals with a diagnosis of T2DM was identified from the …” This suggests that the entire cohort has been diagnosed with T2DM, which I assume to be untrue since the comparisons are between those with and without T2DM. Please clarify.
RESPONSE: This sentence on page 5 has been clarified to indicate that both individuals with and without T2DM were selected for analysis.

21. Methods Study measures: no description of how waist circumference data was collected. This would seem to be challenging to collect as self-report given the variability in how/where waist is measured.
RESPONSE: A description of how waist circumference was collected in SHIELD has been added on page 7. A measuring tape was provided with written instructions for
measuring at the level of the belly button. Waist circumference is used only as a
descriptive variable in this study.

22. Results Para 2 Sentence 4: Please delete “Conversely.” It does not accurately
characterize the relationship shown in the results.
RESPONSE: Conversely has been deleted from this sentence on page 8.

23. Results Para 3 Sentence 1: “Body image perception …” Is this different from
“body image”? This is an example of the importance of consistent terminology.
RESPONSE: This sentence on page 9 has been revised to clarify the terminology.

24. Discussion General: This section could be strengthened by developing it much
more in terms of the current literature and where this research fits. Where is it
consistent, where does it differ, what gaps does it fill?
RESPONSE: Additional information and references have been added to the Discussion
on pages 11 (first full paragraph) and 12 (last paragraph) to highlight how this study
findings fit with other studies. The Bulik study is referenced and compared with the
present study. Also, the Australian study (Charles et al. 2006) is referenced and
compared with the present study. As mentioned in the Discussion, the present study is
one of few that provide data for individuals with T2DM, thus the remaining literature on
body image focuses on individuals with eating disorders or racial differences which we
decided was not relevant to this study.

25. Discussion Para 2: The last sentence can be deleted as it is not related to the
topic of this study.
RESPONSE: This sentence referring to the SHIELD data on dyslipidemia has been
deleted.

26. Conclusion Sentence 5: This final sentence suggests that comparisons were
made across gender groups.
RESPONSE: This sentence on page 13 has been revised to clarify the meaning. Differences in body image perception that were observed in women but not in men suggest that different approaches to weight loss may be needed.

We thank the reviewers again for their careful review of our manuscript. The revisions described above have helped strengthen and clarify the manuscript.

Sincerely,

Kathleen M. Fox, PhD
Corresponding Author