Author’s response to reviews

Title: Impact of three different plate colours on short term satiety and energy intake: a randomised controlled trial

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Author’s response to reviews:

Reviewer 1

* The introduction reports the similar study conducted by Genschow et al, 2012 mentioning that in this study the food intake was lower when food was served in red plates compared to blue plates. White plates are not mentioned. However, in Genschow's study, the participants "ate less snack food from a red plate than from a blue or white plate (Study 2)'\. https://www.ncbi.nlm.nih.gov/pubmed/22245725. Considering that in the present study no blue plate was used but only red, black and white, the omission of white plate seems to be unusual, especially considering the difference in the results obtained in these two studies.

Response: Genschow et al.,2012 conducted two different studies in their paper https://www.ncbi.nlm.nih.gov/pubmed/22245725. In study 1 they compared red and blue cups, in study 2 they compared red, blue and white plates. In light of the comment from Reviewer 1, “white plate” is added to sentence in line 66.

* There is no information on the food composition that was served at the lunch meal. The paper mentioned pasta (line 121) however it is not clear whether the pasta was served alone or with a sauce or other ingredients? If other ingredients were used, how the uniform energy density of the product was assured?
Response: The nutritional composition of pasta that was served at the lunch and its recipe are added to methods line 124. As mentioned, pasta and sauce were mixed until homogenously distributed.

* What types of soft drinks were served? What was the energy density of the soft drinks?

Response: The types of soft drinks and their nutritional value are added to methods line 127 as “The nutritional value of 100 mL of fruit juices were between 63-90 kcal, 12.7-20.0 g carbohydrates.

* Does energy intake reported in Table 3 reflect the intake of solid food or solid + liquid? If latter is true, then the intake of pasta meal and soft drinks should be reported separately as they may have different determinants such as appetite/hunger for the solid food and thirst for the soft drinks.

Response: The previous version of Table 3 reflected the total energy intake from solid and liquid sources. In light of the comment from Reviewer 1, Table 3 is updated and energy intake from solid and liquid sources are presented separately.

* Was the thirst measured?

Response: The thirst was not measured in the current study as participants were guided to consume adequate water on the previous night of the experiments. In addition, when separate energy intake from pasta and drinks were analysed, energy from drinks appeared to be similar.

* How the soft drinks were served? In the containers of the same colours as the plates (i.e., red, black and white)? Please note that in Genschow's study mentioned in the Introduction, both plates and cups were of the same colour

Response: The soft drinks were served in their original cups in order to simulate a common condition and assess the effect of plate colour, alone. This is added to methods line 127.

* What was the material of the plates? Plastic, porcelain, paper, aluminum, etc.?

Response: The materials of the plates is added to methods line 110, as plastic.
* Instead of expressing the individual parameters of appetite assessed by VAS, consider calculating an average appetite score that can be expressed in one figure instead of four.

Response: Calculating an average appetite score that can be expressed in one figure could be an useful approach to visualize VAS outcomes. However, some of the VAS parameters that were used in this study (for instance desire for sugary snack or amount of food) may not reflect equally distributed impact upon the average score. In addition, generally VAS outcomes were presented separately in related literature. Therefore, authors kindly suggest to keep the current version of Figure 1.

* There is not enough discussion on the different results obtained in this study compared to Genschow's study which showed the opposite effect: food intake was lower with the red plate.

Response: The comparison of current outcomes to Genschow’s study is added in discussion lines 261 and 272.

* The measured "desire for sugary snack" may not reflect the immediate sensitivity to the sweetness. If the goal was to assess how plate colour affects the sensory attributes, then probably the intensity of the sweetness of a served soft drink could be measured instead?

Response: Authors agree with Reviewer 1 as “desire for sugary snack” may not reflect the immediate sensitivity to the sweetness but the measurement of the intensity of sweetness of a served soft drink was not included in the goals of current study. In addition, all participants were served same drinks in all occasions of the study. This can be an interesting research topic for future studies.

* The colour of the plate may make the product on the plate looking more appealing (see Hirsh AR, Nutrition and Sensation, CRC Press, 2015, p.150). Did you consider measuring any sensation(s) related to the aesthetics of the plate presentation?

Response: The aesthetics of the plate presentation was not measured in this study. This is added to discussion line 275.

* Line 47: what is "therapeutic manipulation"?
Response: “therapeutic manipulation” is changed to “improvement” in line 47.

* It is unclear what the second visit is? Is that simply refilling the plates?
Response: Participants were allowed to refill their plates by visiting the serving table as much as they wanted in the present study. This sentence is mentioned in line 194.

* If participants ate ad libidum, how their plates were served? Were they pre-filled with an excessive amount of pasta meal? Alternatively, participants could take as much as they wanted?
Response: In case of ad libitum, participants filled their plates by themselves and if they wanted to consume more they could take as much as they wanted. This was stated in line 196.

* The "contrast interaction" is mentioned in the Conclusion, however, there was no definition what is the contrast. In the present study, the black colour was considered a contrast to red colour but it is also a contrast to white colour.
Response: An explanation phrase for contrast is added in conclusion line 302.

Reviewer 2
- Overall: well written manuscript. Some editing and language corrections needed before publication. Example of language problems: "they served" should read "they were served" on page 5 line 118; "lunch was consisted of..." should read "lunch consisted of..." on page 6 line 121; "most of the studies evaluated the effect..." should read "most of the studies that evaluated the effect..." on page 10 line 213; etc.
Response: Language corrections were performed.

- Abstract: the Background focuses on the role of red color in regulating food intake. Suggest to make the background more about the emerging research on the role of plate color in the regulation of food intake. In the Methods section, page 2 line 30, authors should specify that lunch was ad-libitum lunch. Authors use the word sensory when referring to VAS scores; this is not clear and needs clarification. Does "sensory" refer to "palatability"? Authors did not specify the times at which VAS scores were collected. For how long VAS scores were
collected after the standard breakfast and the ad libitum lunch meal? In the Results section, authors should be more specific regarding the VAS scores. Are they referring to mean VAS scores, changes from baseline, AUC values etc.? are they referring to pre-meal, post-meal or total VAS scores? In the Conclusions section, what do authors mean by "in such studies" on page 2 line 40?

Response: Background is changed according to Reviewer 2’s suggestions. “Ad-libitum” is added to page 2, line 30. The word sensory is omitted to clarify the terms. The specific times for VAS is added to methods line 149. Due to word limit, this information could not be added to abstract. In results it is specified that VAS outcomes were presented as mean, total scores (line 36). “Such studies” is described in conclusion.

- Keywords: again, suggest not to focus on the "red" color as a main keyword since it is about the plate/food contrast rather than the color itself. Also, suggest to delete the keyword "consumption" since in my opinion there is no difference between "energy intake" and "consumption".

Response: The keywords “red” and “consumption” are omitted.

- Introduction: what do authors mean by "domestic" and "external" dishware sizes on page 3, line 49? what do authors mean by "...other studies reported that individual's response to red colour in nutrition was not direct and generalizable", on page 3 line 67? Authors support their use of pasta, red sauce and soft drinks as healthy meal choices, unlike other studies. Not sure if the use of soft drinks should be promoted as healthy by authors. Suggest to highlight that they are testing the effects of plate color on food intake at regular meal times rather than at snack times, without discussing the healthiness of the meal choices. Again, what do authors mean by "sensory" on page 4 line 83 and line 85?

Response: The terms are changed on page 3, line 49 and line 67 as “dishware sizes have increased both at home and outside home” and “the stopping effect of red colour was not always a valid predictor of food intake”, respectively. The soft drinks that were used in this study were non-carbonated fruit juices. In light of the comment from Reviewer 2, regular meal times is emphasized in line 79. As the consumption times of foods were not given in referenced studies (14,15,18), the latter part of the sentence is kept as “with snack foods”. The word “sensory” is omitted.

- Methods: what "questionnaire" are authors referring to on page 4, line 89? is it a screening questionnaire? this should be clarified and described in more details. What was the reason
behind the exclusion of "professional athletes"? I don't understand the impact of being an athlete on the outcomes of the study. Why did authors ask participants to complete a Beck Depression questionnaire? this should have been explained with respect to the impact on the outcomes of the study. Why did authors measure body composition? which components of body composition can be assessed through Jawon XScan Plus? Authors mention on page 5 line 100 that sessions were arranged at one week before menstruation to avoid influence of hormonal imbalances on the outcomes. This is contradicted when they state on page 5 line 107 that there was "one-week washout period between each study day". Authors should clarify or adjust this discrepancy in information. How participants had a standardized dinner? did authors guide them on what to eat the night before the study sessions? Authors describe the different VAS scales assessed; there is nothing about sensory assessment. Authors have referred several times to sensory assessment by VAS, which is not described in the Methods section. Again, authors should specify the times at which these VAS were administered.

Response: The “questionnaire” is defined as “A questionnaire examining general health and nutritional habits for screening applied to all volunteers in order to determine available subjects.” As professional athletes nutritional habits, eating response and metabolism can be different to non-professional healthy individuals they were excluded. Again, individuals who are prone to depression may have altered nutritional motives. As the study population in current research composed of healthy individuals, this test was necessary. An explanation was added to line 98. The body composition parameters are added to line 100. For menstruation “at least one week” explanation is added to line 109. Participants were guided to have standardised dinner, this is added to line 118. The word for “sensory” is omitted.

Results: Authors report waist circumference data. Information on body composition analyses performed should have been detailed in the Methods section. VAS data should be analysed and represented in a clearer manner. Authors are reporting on mean VAS scores for the whole testing day. Not sure if these values can reflect the satiety feelings happening before and after the consumption of a breakfast meal or a lunch meal. Suggest that authors re-run the VAS data analyses, describing the effects of plate color on VAS scores after the consumption of the lunch meal...this might reveal more relevant data. In addition, authors should again be more specific about the times at which these scores were collected.

In table 3, authors describe the number of participants for each plate color with respect to the second visit to the buffer. For consistency, suggest that authors provide data on the number of participants per plate color at the first visit as well.

Response: Body composition data is added to results line 183. The VAS scores in current study was analysed and presented according to general literature that examines interaction between any
manipulated nutritional status and food intake. Presenting and analysing of VAS scores in a complete data set is a well-known method in such studies. Therefore, authors kindly suggest to keep the current version of VAS data. The specific times for VAS is added to methods line 148. Also, Figure 1 already presents the specific times. The data on the number of participants per plate colour on Table 3 is added.

Discussion: well written. Authors should though comment on the reasons why plate colors had an impact on energy intake at the first visit and not the second visit to the buffet. This is interesting to discuss. Are the effects of plate colors lessened over consumption time of the meal? Also, in the limitations, authors should clearly state that data from this study cannot be generalized to the general population since only women were recruited.

Response: The impact of plate colour on energy intake at the first visit is indeed an interesting point to discuss and this is added to discussion line 236. The sentence “The findings of current study cannot be generalized to population.” is added to discussion line 296 where sex differences was already mentioned.

- Figures: figure 1 is not described anywhere in the text. This is missing, and should be described in the text.

Response: “Figure 1” was written in results line 184.