Reviewer’s report

Title: Exploratory Study of The Impact of Perceived Reward on Habit Formation

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Reviewer: Katarzyna Stawarz

Reviewer's report:

The paper describes a 16-week study exploring the role of pleasure, perceived utility, perceived benefits and intrinsic motivation on habit formation. Authors show that intrinsic motivation and pleasure moderate the relationship between repetition and habit, and that stable context supports the process of habit formation. These findings are important as they can help to inform future behaviour change interventions.

While in general I think the paper is interesting and well-written, there are a few things that would benefit from clarifications, especially regarding the study design. Overall I think this is a good paper and addressing the points below can further improve the manuscript.

Main points:

1. The aim of the study was to investigate formation of new habits, and yet criteria for the flossing intervention was to "floss no more than twelve times a month". Doing something multiple times per week seems rather frequent. Would it be possible to add more information about participants to better understand how many were completely new to the habits vs how many had some experience? This would help to interpret the final results.

2. Related to the above, authors mention the possibility of dormant habits and that if participants were judged to have been re-exposed to old cues, making it possible for their dormant habits to manifest, the automaticity score was marked as 0 or missing. How many participants in each intervention group demonstrated dormant habits? Were they included in the final analysis?

3. Authors measured several factors related to perceived reward for the vitamin C intervention, but only pleasure for flossing. Why?
Additional points:

4. Table 2: I found it interesting that the scores went up during the first time point after the intervention, but then progressively went down for behaviour measures and vitamin C automaticity until T4. While T4 is still significantly higher than T0, this decrease is interesting - I would expect it going up steadily up to reach the plateau. Do the authors have any thoughts on why this was is case?

5. Why do authors decided to use two different habits? I agree with the authors that 4 weeks gap between the habits is sufficient, but I'm wondering why use two in the first place. Each intervention is justified with information about its suitability to study mechanisms of habit formation, but I don't think the authors explain anywhere why they decided to use both in the same study.

6. The authors write that 80 participants received vitamin C intervention at baseline and then all 118 participants received a face-to-face flossing intervention 4 weeks later. The remaining 38 participants received a hand washing intervention at baseline, which was already a highly automatic behaviour, and thus the intervention had to change. Technically, this means that while 80 participants worked on two different habits, the "hand washing group" worked on de facto one (flossing). Was there a difference in flossing strength between these two groups?

7. In the Note to Table 1 authors say that "due to methodological limitations the context stability items were not tested for the first 40 participants". This made me wonder why: was it because the first 38 participants received a different intervention? But then what about the other 2? Later on authors say that this was because "data collection problems". I would suggest using the latter phrase in the table, to reduce confusion.

Are the methods appropriate and well described?
If not, please specify what is required in your comments to the authors.

No

Does the work include the necessary controls?
If not, please specify which controls are required in your comments to the authors.

Yes

Are the conclusions drawn adequately supported by the data shown?
If not, please explain in your comments to the authors.

Yes
Are you able to assess any statistics in the manuscript or would you recommend an additional statistical review?
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