

Dear Prof. Dr. Dodd,

Thank you so much for the chance to resubmit our manuscript and respond to the reviewer's concerns.

We would like to draw your attention to an error we corrected in the analysis plan. In the previous version of the manuscript, we stated that in the Generalized Mixed Models we would allow only the intercepts to vary per Participant and Target Speed. However, we will let intercepts and slopes for the difference between target and dot cloud speed vary per Participant and Target Speed. Both in the code used to analyze the pilot data and in the code used for the power analyses, we already used this analysis, and it is the recommendation of Moscatelli & Lacquaniti (Moscatelli, Mezzetti, & Lacquaniti, 2012). It was thus merely an oversight in the manuscript, for which we apologize. We corrected this mistake in this version of the manuscript.

Sincerely,

Laurence R. Harris & Björn Jörges

Response the Reviewer

Comments to the Author

Thanks to the authors for responding to my previous comments. While the authors did reply to my comments in the response to authors, many of these interesting discussions are still omitted from the manuscript. That is a shame. Also, a red-lined version of the manuscript would have been helpful to guide the reviewer to where changes have been implemented.

1. We were not aware that a red-lined version of the revised manuscript was acceptable. We are adding a version of the present manuscript with track changes activated.

In response to author response 2.1 and the novelty of probing speed perception, which is mentioned in the significance and elsewhere, please consider the following recent publications:

Hogendoorn, H., Alais, D., MacDougall, H., & Verstraten, F. A. (2017). Velocity perception in a moving observer. Vision research, 138, 12-17.

Garzorz, I. T., Freeman, T. C., Ernst, M. O., & MacNeilage, P. R. (2018). Insufficient compensation for self-motion during perception of object speed: The vestibular Aubert-Fleischl phenomenon. Journal of vision, 18(13), 9-9.

2. Thank you for pointing out these publications. We included these references in the introduction. However, both deal with rotational, physical observer motion; the novelty of the combination of lateral object motion and lateral, visually stimulated self-motion proposed in this project remains thus, to our understanding, unchanged.

Also note, when dealing with two or more dimensions, velocity typically refers to both direction and speed. If only one-dimensional speed will be judged, suggest using the word speed throughout.

3. We thank the reviewer for this observation and replaced "velocity" with "speed" throughout the document when we were talking about one-dimensional speed.

In response to response 2.4, it is possible that the observer does not perceive self-motion and attempts to judge object motion relative to the self and world, but this judgment is biased by the background motion. This would be induced motion but would also look like perceived self-motion with partial compensation for self-motion.

4. We agree that induced motion would yield the same results as a partial compensation for self-motion. We made substantial changes to the overall experiment to accommodate for this issue:
 - Most importantly, we added two control conditions. In the first condition (“Textured Moving Backdrop”), we aim to minimize the effect of visually simulated self-motion in order to isolate the effect of induced motion. In this condition, no self-motion is simulated visually. Rather, the wall backdrop of the experiment is moved to the left or to the right, which should induce motion of the target ball, while only evoking minimal perceived self-motion.
 - In the second condition (“Blank Backdrop”), we remove the texture from the wall. This should minimize the effect of induced motion on the target ball, while impacting perceived self-motion only minimally.
 - We furthermore added objects in the foreground of the visual scene in order to maximize the sense of self-motion in absence of a textured wall backdrop (“Blank Backdrop”), and in order to enhance the sense of a still world and a moving wall backdrop for the “Textured Moving Backdrop” condition.
 - After finishing the main experiment, participants are shown different self-motion/wall motion conditions and indicate whether they moved, the world moved or the wall moved, on a continuous scale. We only include participants who judged self/world motion within a margin of error of our intended interpretation. From our own and our colleagues’ experience with the stimulus, we are confident that most participants will perceive the self-motion conditions as intended.
 - To keep the duration of the experiment around one hour, we reduced the number of maximum trials per PEST from 35 to 27. Further, instead of having separate PESTs for left and rightwards motion, the motion direction was randomly chosen between left-to-right and right-to-left for each trial, with both motion intervals within each trial always moving in the same direction.
 - This, of course, reduces the power. We therefore conducted the power analysis again for these new conditions and now aim for 30 participants.
 - You can find a longer sequences of the new main experiment [here](#) and a sequence of the self-motion judgments [here](#).

Generally, the use of visually-simulated self-motion rather than real self-motion (and the limitation of this approach) is still not sufficiently addressed.

5. We added a section to discuss the various cues’ contribution to the final estimate of self-motion. We will furthermore dedicate a section in the discussion to making sure that the reader has a clear picture of what this project examines (i.e., visually simulated self-motion).

In response to response 2.6, this discussion of possible scenarios is useful and should probably be included in the manuscript as it addresses the question of the effectiveness (or not) of inducing vection. I see 5 possible scenarios: 1) subject perceives self-motion, and judges relative to scene (and world) 2) subject perceived self-motion and judges relative to self, 3) subject does not perceive self-motion and judges relative to scene 4) subject does not perceive self-motion and judges relative to self (and world). 5) subject makes judgements using a combination of reference frames, as previously suggested by Dokka et al.

6. We included these considerations into the manuscript.

In response to response 2.14, there are still several places in the manuscript that refer to observer motion when they should refer to visually-simulated observer motion. The bullet points on page 3 are a notable example.

7. We went through the document again and made clear in every instance that we simulate self-motion only visually. We used the suggested expression “visually simulated observer motion” throughout.

References

Moscatelli, A., Mezzetti, M., & Lacquaniti, F. (2012). Modeling psychophysical data at the population-level: The generalized linear mixed model. *Journal of Vision*, 12(11), 1–17.
<https://doi.org/10.1167/12.11.26>