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Comment on nhess-2021-79

Anonymous Referee #2

Referee comment on "Flood–pedestrian simulator for modelling human response dynamics during flood-induced evacuation: Hillsborough stadium case study" by Mohammad Shirvani and Georges Kesserwani, Nat. Hazards Earth Syst. Sci. Discuss., https://doi.org/10.5194/nhess-2021-79-RC2, 2021

The paper "Flood-pedestrian simulator for modelling human response dynamics during flood-induced evacuation: Hillsborough stadium case study" aims at showing the effect of human-body characteristics and in-model behavioural rules when included in an ABM integrated framework for flood evacuation modelling. The model is largely based on the previous version developed by the authors, and it is tested on a synthetic case study and on a real-world case. The topic of this study is definitely highly relevant and timely. However, I think that the study could be further strengthened by assessing the effect of the evacuation time and characteristics of the inflow hydrograph on the evacuation process. These factors could have a higher impact than the human-body characteristics considered by the authors for flood risk mitigation purposes.

- It has been recently shown that the timing in which the evacuation is issued is crucial for reducing flood risk (Alonso et al., 2020). However, in section 2.3.1 the authors state that "*When the floodwater starts to propagate over the walkable area, simulation time (t) of 0 min, the pedestrian agents start the evacuation …*" In a no-flooding situation, agents are randomly moving based on their behaviours and on their daily routines. Why an agent should start moving exactly when the water starts entering the building and not before or after? Are there supporting evidence to justify such an assumption? Then, when flooding occurs, there can be two extreme situations. On the one hand, if the agent is doing something else it may not notice the flooding until the pedestrian agent goes on a flooded area. On the other hand, the agent could be informed earlier about a coming flood and start to evacuate earlier. These two scenarios could have dramatic consequences. I suggest including more modes (table 6) accounting for different evaluation timing. This study could show the role of human-body characteristics and in-model behavioural rules in reducing flood risk when evacuation is issued late.

- My second concern relates to the shape of the hydrograph considered in the synthetic experiment. I understand that using a hydrograph with a high flood peak would lead to significantly bigger HR and the consequent loss of life. However, is it not the scope of this

model to represent worst-case scenarios to improve flood risk management and reduce loss of people? Also, not necessarily using a shorter hydrograph can lead to loss of life. I invite the authors to run different scenarios keeping the same volume of the input hydrograph but changing the timing of the peak. The timing of the peak is a crucial factor in any flood risk management application and I do not understand why its influence was not included in this study.

- Section 2 is a very large and dense section. There are many headings and sub-headings and I found myself lost with a need to scroll up and down. Would not be better to move 2.3.1 and 2.3.2 in a new section 3 called synthetic case study used to test the model and then introduce section 4 (now section 3) on the real-life experiment?

Reference:

Alonso Vicario, S., Mazzoleni, M., Bhamidipati, S., Gharesifard, M., Ridolfi, E., Pandolfo, C., & Alfonso, L. (2020). Unravelling the influence of human behaviour on reducing casualties during flood evacuation. Hydrological Sciences Journal, 65(14), 2359-2375.