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Title	The influence of herding behaviour on departure time choice in case of an evacuation
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Abstract	<p>Natural disasters, such as earthquakes and tsunamis, are very stressful events for people. The (re)action of an individual depends on a lot of aspects. One important aspect is that a person has to be capable to process and interpret incoming information. The individual will have to make a decision about an appropriate (re)action. But because of time pressure, possible ambiguity of the situation and therefore the need for additional information, the individual will see others as a source of information to guide his own behaviour. In psychology, this is called informational social influence (Deutsch & Gerard, 1955). The behavioural consequence is that especially in highly uncertain, ambiguous and stressful situations such as natural disasters, an individual tends to follow others almost blindly. This is called herding behaviour and it means that seeing other people doing something and believing that what they are doing is a good alternative, results in doing the same thing (Ariely, 2008). We can thus hypothesize that herding behaviour is an important phenomenon in natural disasters.</p> <p>Data collection approaches and experimental set-up</p> <p>Current data collection techniques lack the level of detail to capture this herding behaviour, especially in case of natural disasters. Therefore, we have developed <i>Everscape</i> (Dorado et al., 2012), which is a 3D multi-user virtual environment that offers opportunities to focus on this type of behaviour. In Van den Berg et al. (2012), we have shown that our virtual environment provides opportunities for data collection on travel choice behaviour in case of natural disasters. Besides that, it shows potential for research on herding behaviour in case of evacuations. Participants are aware of each other's existence because they can see each other and each other's actions and behaviour. Our main question in this paper is <i>does herding behaviour influence departure time choice in case of an evacuation?</i></p> <p>We have conducted 14 experiments with <i>Everscape</i>, each with approximately 30 participants. During the experiments all participants were flown to an island by helicopter. After arrival, an avatar was appointed to them and they had to take a car to drive to a concert at the other side of the island. During the concert an earthquake struck which triggered a tsunami. The participants were informed about this tsunami through a news item at the concert area. To evacuate, they had to travel back to the helicopter. Those who arrived at the helicopter on time would survive.</p> <p>Research approach and results</p> <p>To specifically consider herding behaviour, we have tested four different scenarios with and without <i>spooks</i>. These spooks knew what was going to happen and they had a special task to find out if their behaviour would influence the other participants. We tested the following four scenarios, with a focus on departure time choice:</p> <p>No spooks.</p>

15-20% spooks with the following task: leave the concert area before the earthquake, run back to the concert area during the earthquake, leave the concert area during the news item and take a train.

15-20% spooks with the following task: leave the concert area during the earthquake and take a car.

15-20% spooks with the following task: stay at the concert area.

The results show that when there is no disaster and the situation is clear and stable, people do not follow others but when there is an earthquake, which is an unexpected ambiguous situation, the behaviour is influenced by the actions and behaviour of others. For example, in the experiment where the spooks left during the earthquake (C), people left the concert area more quickly and continued their evacuation from the concert area. But when the spooks showed more hesitant behaviour (B), more people tend to stand still and look around or run back and forth. These results are in accordance with the informational social influence theory.

The full paper provides a more detailed description of the research approach with the different scenarios. For the first time, we quantitatively show with the data from *Everscape* experiments that herding influences departure time choice in case of an evacuation by presenting and discussing choice models that were estimated. We do this by using as herding attributes the number of people each participant saw leaving from and staying at the concert area prior to his own departure. These results show that the more people a participant sees leaving from the concert area, the more a participant is likely to leave the concert area himself.

References

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