Investigating Insight Generation and Decision Making with Visualizations in 2D and 3D Virtual Environments

Devin M. Gill¹, Ian T. Ruginski¹, Joshua Butner¹, Michael N. Geuss², Jeanine K. Stefanucci¹, & Sarah H. Creem-Regehr¹
1. University of Utah - Department of Psychology
2. U.S. Army Research Laboratory, Human Research and Engineering Directorate

Method

Participants
40 college-aged students (M_age = 25.10, SD_age = 7.60; F = 20, M = 19, T = 1) participated in the experiment. 20 participants per condition.

Materials and Apparatus
A map of a fictional city was created using Unity version 5.6.1, VRKT version 3.1. Socio-cultural information could be displayed with user-controlled overlays. The 2D version was displayed on a stand-alone monitor. The 3D version was displayed in the HTC Vive HMD.

Procedure
In this simulation, a terrorist has been leaving bombs in crates around a city. Officials believe the terrorist is following a pattern in choosing their targets. Your job is to determine the most likely location for the next crate to be placed in so that security can be increased within the area. To assist with this, you will have access to a map containing information about the city and the previous attacks.

Map Task
2D vs. 3D

Survey

Outcomes
- d' (Sensitivity to variables)
- Total Trial Time
- Overlay time
- Graph Literacy
- Sense of Direction

Results
Both groups showed poor accuracy (< 50%).
A comparison between groups showed that, on average, the 2D group was more sensitive to variables correlated to the correct answer compared to the 3D group.

Wilcoxon Rank Sum Test
W = 276.5, p = 0.036

Conclusions
Insight generation was difficult for both the 2D and 3D groups. Although the 2D group was more sensitive to the important variables necessary for the task, and seemed to ignore unimportant information, the lack of differences between groups counters previous work suggesting a 2D advantage for particular tasks [7].

Future Directions
Given the difficulty of the insight generation task, an easier problem may be adopted to see if the display has a greater effect when participants are better able to arrive at an accurate response [8].

References

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