Using Specially Engineered Blocks to Measure Differences in Spatial Cognitive Processes

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Introduction

- Most assessments of spatial cognition are administered with paper-and-pencil.
- Others have limited scoring methods, and therefore miss important variations, such as the Block Design Task (BDT) where individuals copy designs using blocks.
- These assessment limitations impede insight into the individual differences in strategy use.
- This project utilizes engineered blocks, Smart Cubes (sCubes), that can record real-time movements and connections of blocks.
- The sCubes are designed to capture *how* individuals complete the BDT.

Methods

- 26 participants completed 10 BDT patterns using the sCubes.
- The system records the actions taken by the individual, and thus captures each intermediate state of blocks.
- The series of states become the path an individual takes to complete the design.
- Paths are then compared between individuals to determine specific patterns in completion.

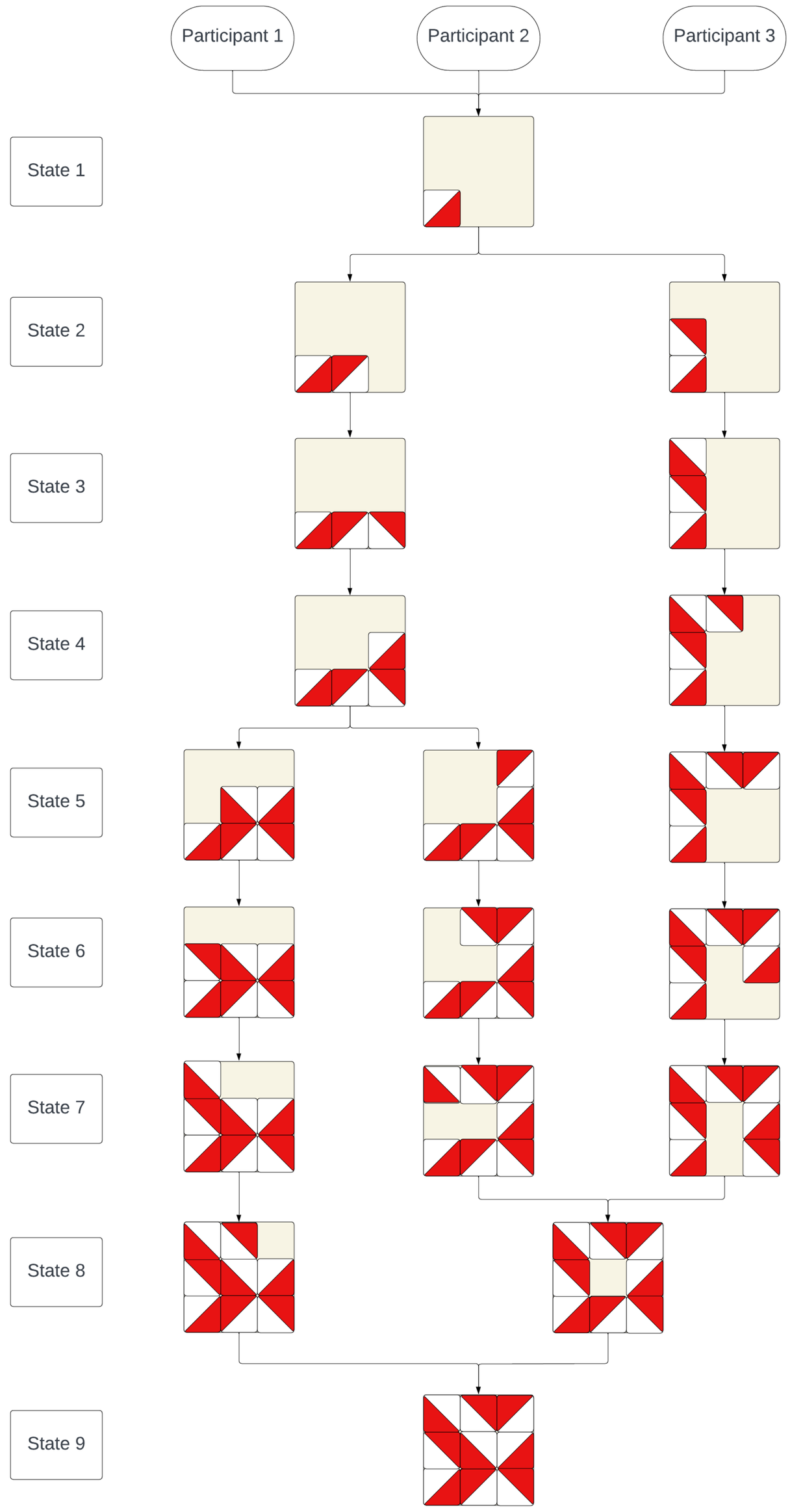
Results

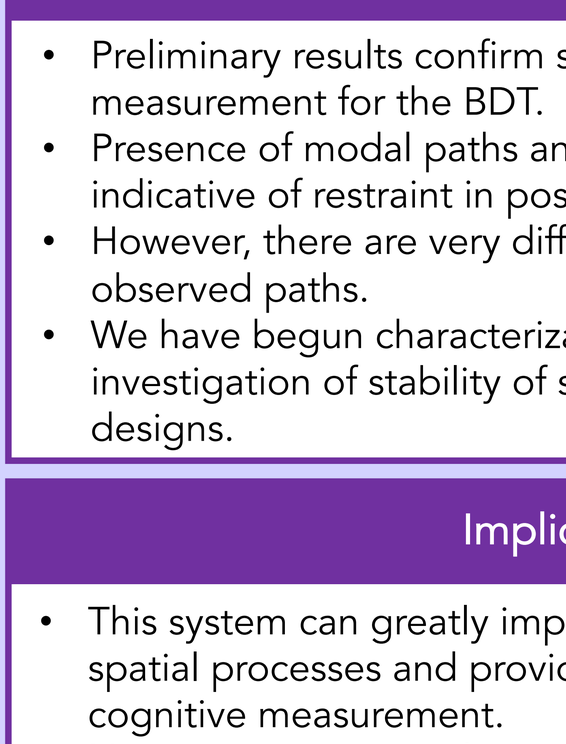
- Preliminary results confirm sCubes as a viable method of measurement for the BDT.
- Presence of modal paths and convergent states is indicative of restraint in possible completion strategies.
- However, there are very differing strategies in the observed paths.
- We have begun characterization of these strategies and investigation of stability of specific strategy use across designs.

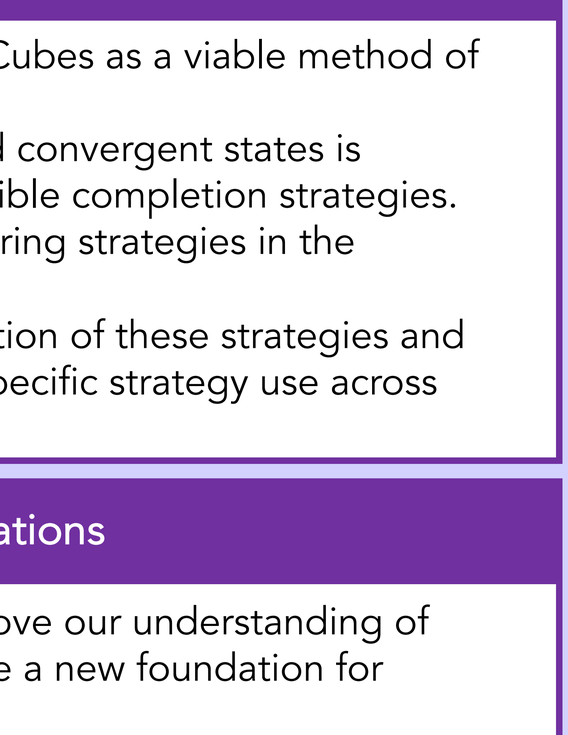
Implications

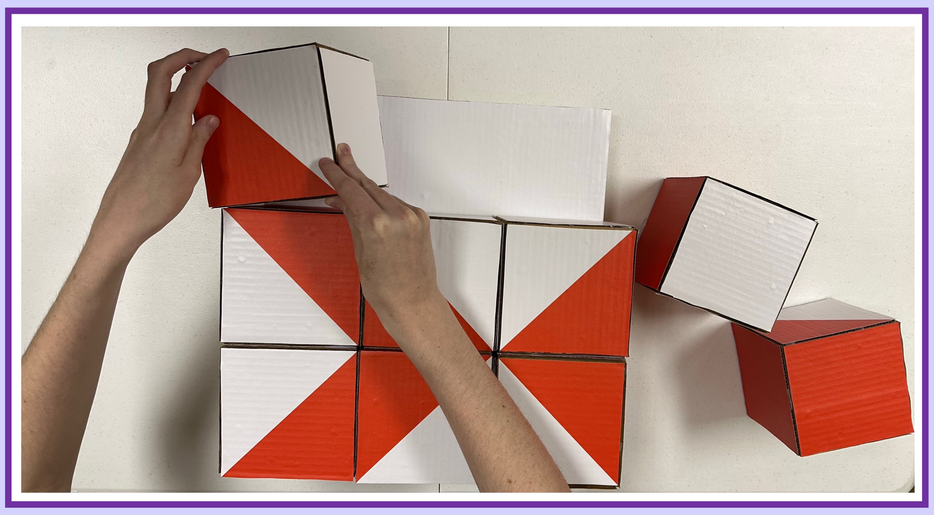
- This system can greatly improve our understanding of spatial processes and provide a new foundation for cognitive measurement.
- Next steps are to implement AI-based algorithms to detect patterns in large datasets and apply this system to new tasks.

Path Representation









Citations

- Dunn, A. C., Qiao, A., Johnson, M. R., & Kunda, M. (2021). Measuring More to Learn More From the Block Design Test: A Literature Review. In Proceedings of the Annual Meeting of the Cognitive Science Society (Vol. 43, No. 43).
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