

## Semantic associations across development

Adults are thought to have well-established, efficient semantic networks<sup>1</sup>. Ironically, this can result in memory distortion (e.g., DRM paradigm)<sup>2</sup>. Young children are less susceptible to these distortions<sup>2</sup>. This may point to differences in underlying network structure & content, but it is unknown how concept organization differs across development

### Research Questions

- How are concepts organized differently in adults and children?**
- Structure:** Is the adult network better organized around important concepts (i.e., more centralized)? Are children more idiosyncratic?
  - Content:** Are the networks centralized around different concepts? Do adult networks more accurately reflect co-occurrences in the environment?

## Free association task

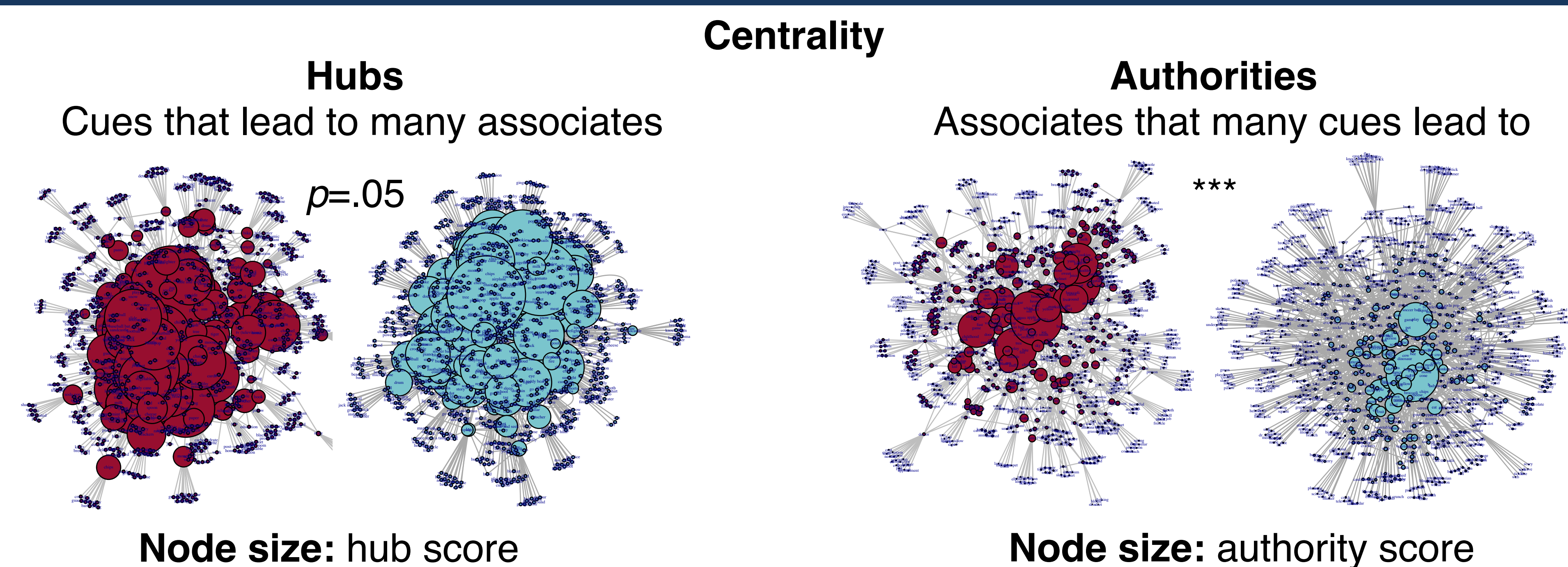
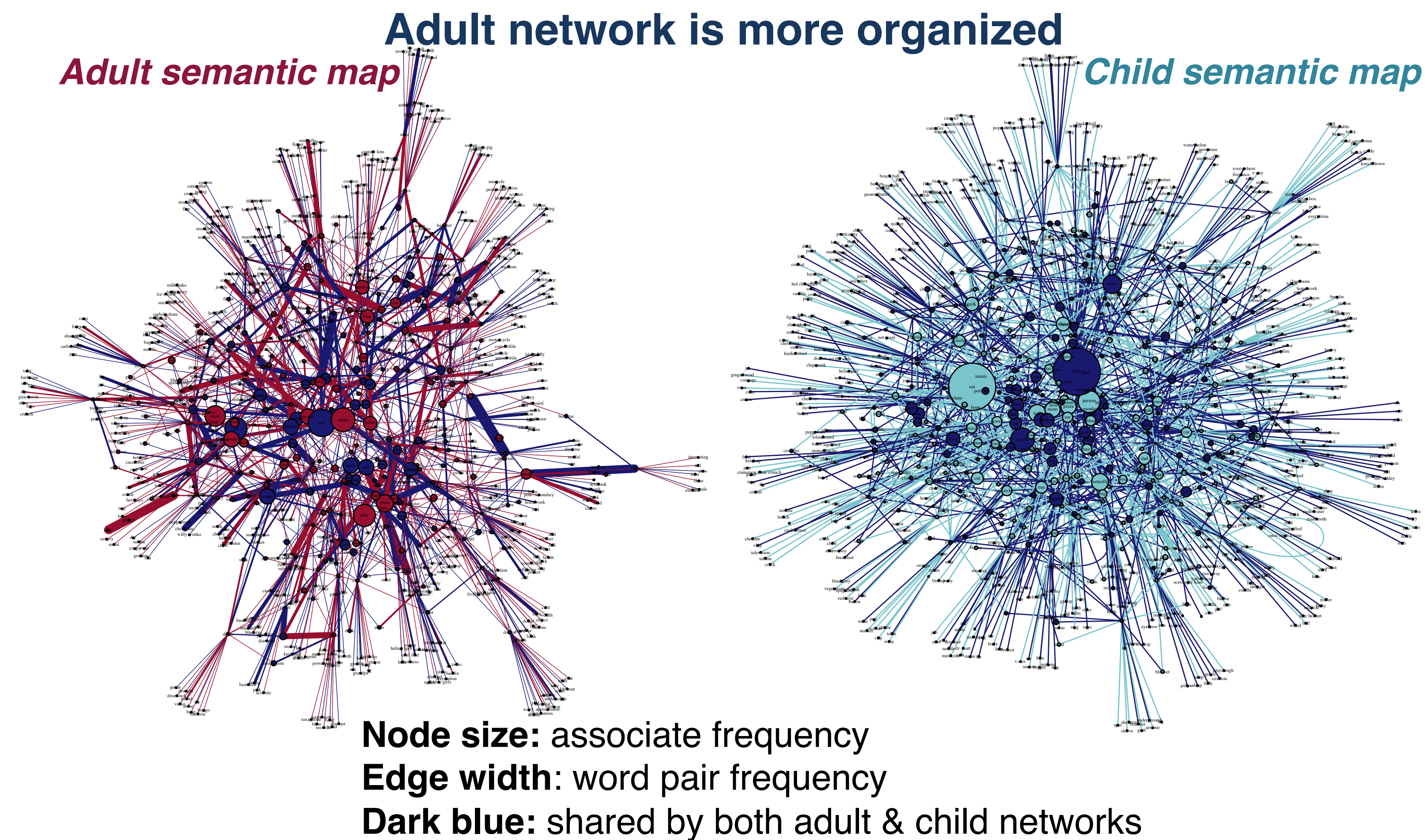
100 nouns from category norming study with 3-5 year old Canadians<sup>3</sup>  
 4 words per category  
 25 words per participant (1 per category)  
 100 **adults** (native English speakers)  
 100 **children** (4-5yo; native English speakers)



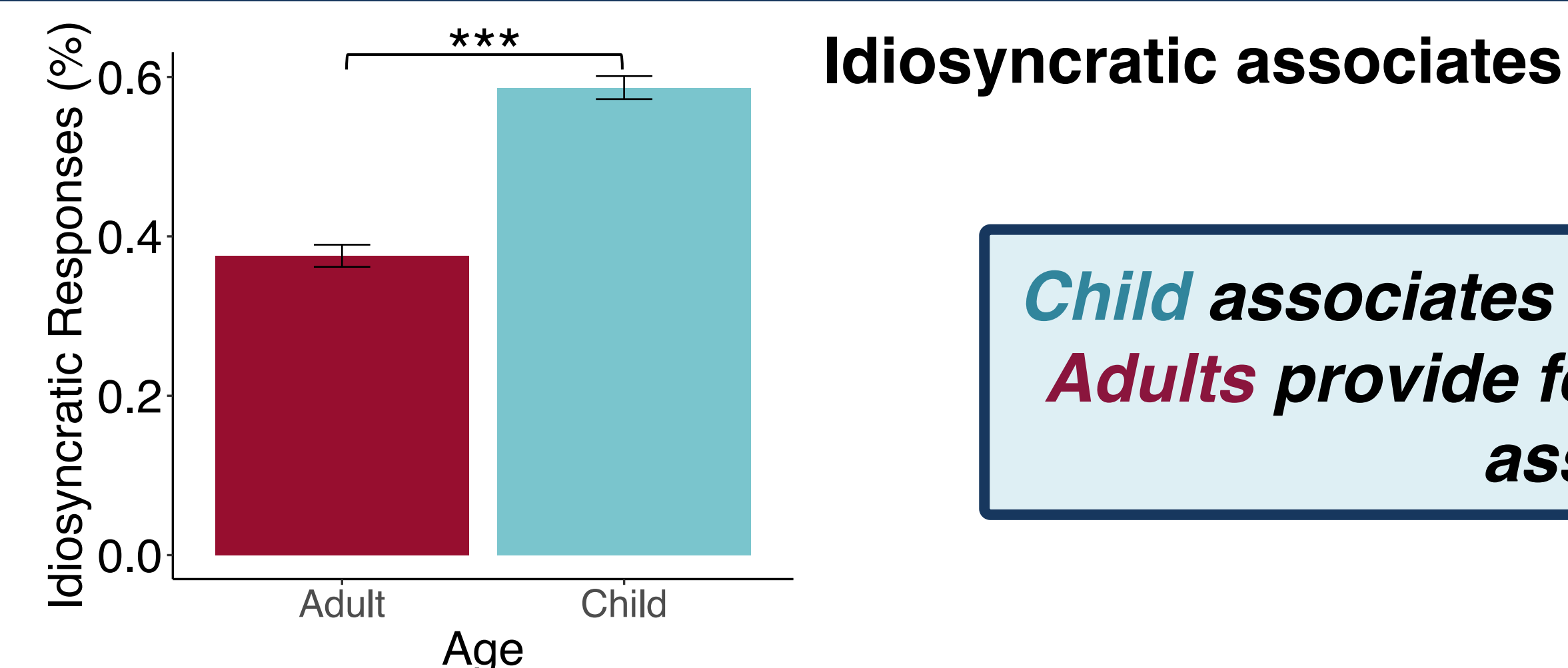
“As fast as you can, what’s the first word you think of when I say the word PIZZA?”  
 “If someone asked me, I might say PEPPERONI, because that goes on top of pizza”

## Study Outline

- Structure**  
 Semantic maps: Global structure of networks  
 Centrality: How are the networks organized around specific concepts?  
 Idiosyncratic associates: What % of responses are unique to one participant?
- Content**  
 Centrality of shared associates: Are the networks organized around the same concepts?  
 Real-world co-occurrence & word pair frequency: Do the networks accurately reflect the environment?  
 Real-world co-occurrence between networks: Do adults more accurately reflect the environment?  
 Real-world co-occurrence & shared pairs: Do pairs from both networks more accurately reflect the environment?



**Cues in children lead to more associates**  
**Associates in adults are consistent and more central in the network**



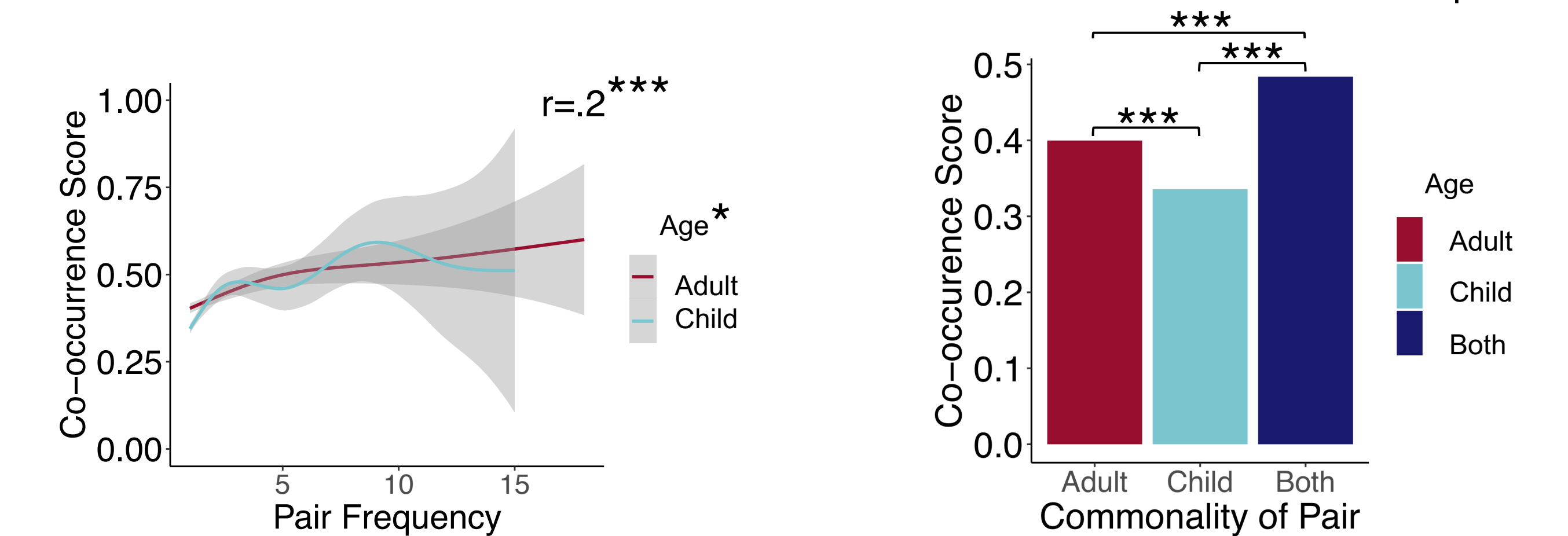
## Both networks organize around the same concepts



**Shared associates are more centralized in both networks**

## Adult & shared pairs reflect real world co-occurrences

Co-occurrence: rate of word-word co-occurrence from GloVe<sub>4</sub> dataset



**More frequent pairs better reflect co-occurrences in the world**  
**Adult word pairs better reflect co-occurrences in the world**  
**Shared pairs better reflect co-occurrences in the world**

## Conclusions

- The **adult** network is more centralized and uniform, while the **child** network is more distributed and idiosyncratic
- Both** networks organize around the same concepts
- Adult**, frequent, and **shared** pairs better reflect real life co-occurrences
- Adults’ better organization & use of real world co-occurrences may explain adult susceptibility & child resistance to memory distortion
- The beginning of an adult-like network may be present by 4-5 years  
 → Differences due more to structure than content?
- Future directions:** Child networks may be shaped by poor generalization<sup>5</sup> & good retention of verbatim information<sup>6</sup>

### References

- <sup>1</sup> Bjorklund, D. F. (1987). How age changes in knowledge base contribute to the development of children’s memory: An interpretive review. *Developmental Review*, 7, 93–130.  
<sup>2</sup> Brainerd, C.J., Reyna, V.F., Forrest, T.J., 2002. Are young children susceptible to the false-memory illusion? *Child Dev.* 73, 1363–1377.  
<sup>3</sup> Price, H.L., Connolly, D.A., 2006. *BatMon II: Children’s category norms for 33 categories.* *Behav. Res. Methods* 38, 529–531.  
<sup>4</sup> Jeffrey Pennington, Richard Socher, and Christopher D. Manning. 2014. *GloVe: Global Vectors for Word Representation.*  
<sup>5</sup> Gentner, D. (1988). Metaphor as structure mapping: The relational shift. *Child Development*, 59, 47–59.  
<sup>6</sup> Sloutsky, V.M., Fisher, A. V. 2004. When Development and Learning Decrease Memory. *Psychol. Sci.* 15, 553–558. <https://doi.org/10.1111/j.0956-7976.2004.00718.x>