Adults vs. kids: Changes in connectivity between the amygdala subnuclei and occipitotemporal cortex

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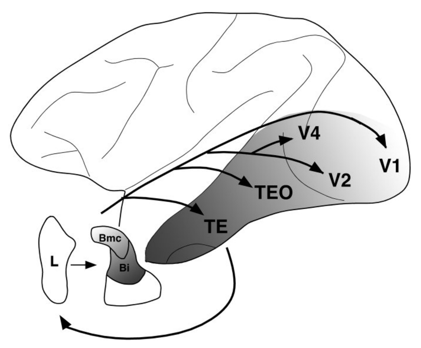
BACKGROUND



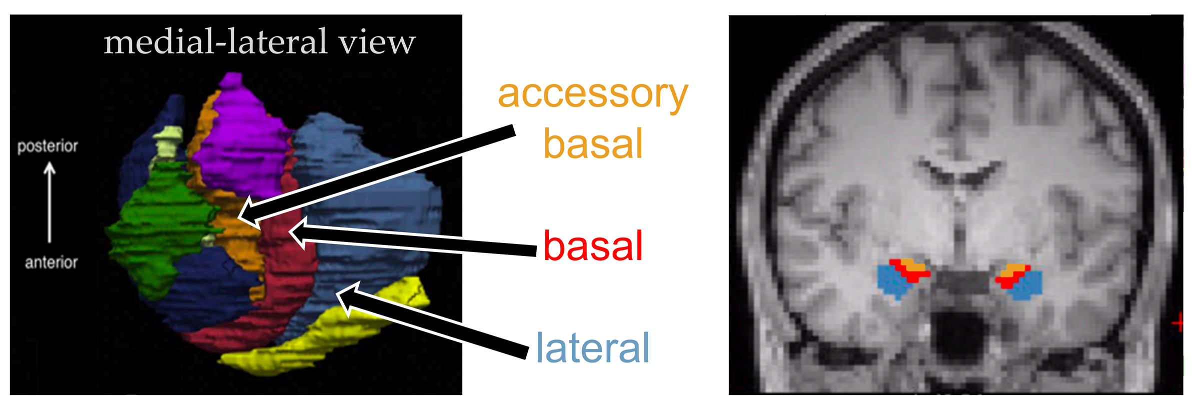
- In adult Macaques, ventral and rostral amygdaloid regions project more heavily to rostral visual areas (e.g., area TE), whereas more dorsal and caudal amygdaloid regions project more heavily to caudal visual areas (Freese & Amaral, 2005).
- Adult monkeys show projections from areas TEO and TE to the lateral nucleus of the amygdala, and from area TE to the basal and accessory basal nuclei. In addition to these adult-like projections, infant monkeys show connections between inferior temporal areas and the amygdala that are either totally eliminated in adults or more refined in their distribution (Webster et al., 1991).
- In humans, amygdalar connectivity becomes increasingly sparse and localized with age (Saygin et al., 2015).

RESEARCH QUESTIONS

- Can we delineate the connectivity between the amygdala subnuclei and the occipitotemporal cortex in humans?
- Does the connectivity differ across development?

METHODS

- **Defined seeds**: Parcellated the lateral, basal, and accessory basal subnuclei of the amygdala in each individual using the atlas from Saygin et al. 2017.



- **Defined targets**: Made occtemp labels combining all Freesurfer anatomical regions in the temporal cortex (superior, middle, and inferior temporal; banks of the superior temporal sulcus; fusiform; transverse temporal; entorhinal; temporal pole; parahippocampal) and occipital cortex (lateral occipital; lingual; cuneus; pericalcarine). Split entire occtemp label into 5 equal sections, from anterior to posterior.
- Using Diffusion Weighted Imaging data (b-value 700s/mm^2, 60dir), ran tractography between the amygdala subnuclei and each of the 5 occtemp labels with FSL.

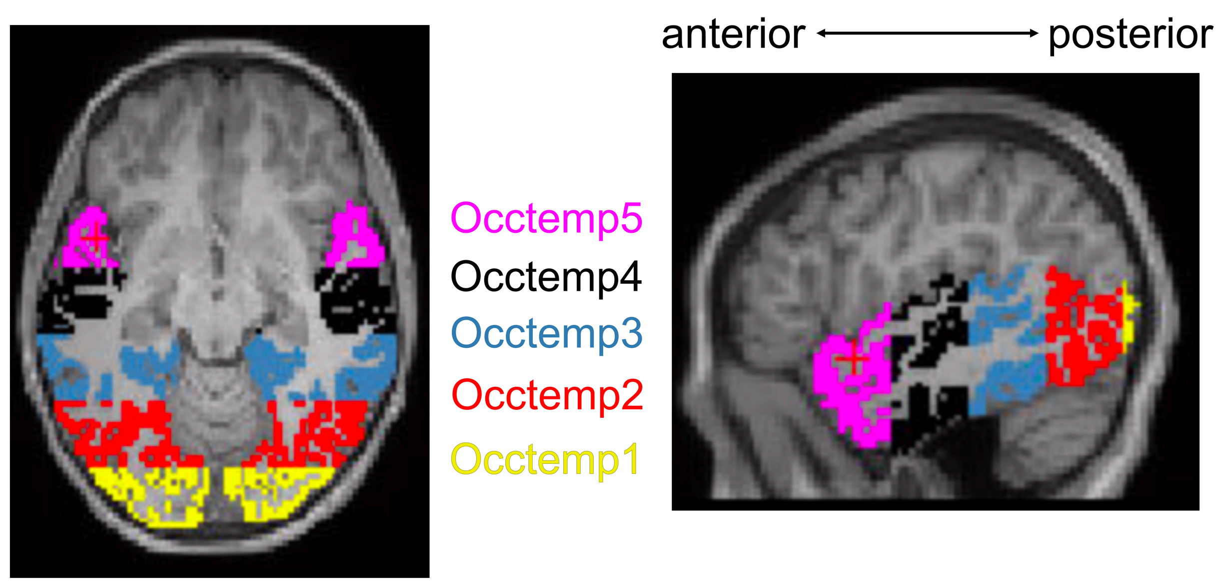


Figure 1: Adults (N=20)

Connectivity gradient between each subnucleus of the amygdala and the occipitotemporal cortex, averaged across all adult subjects

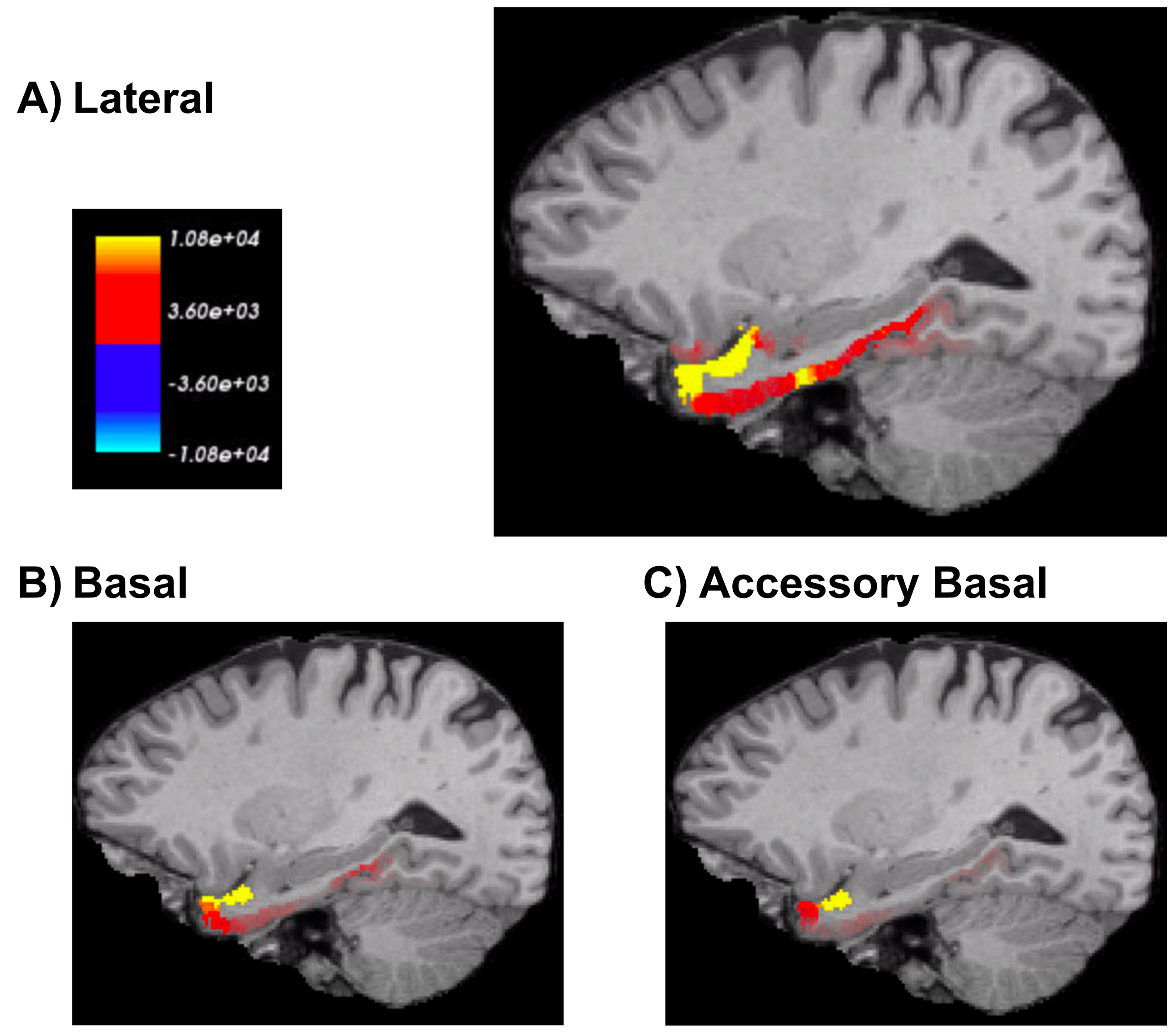
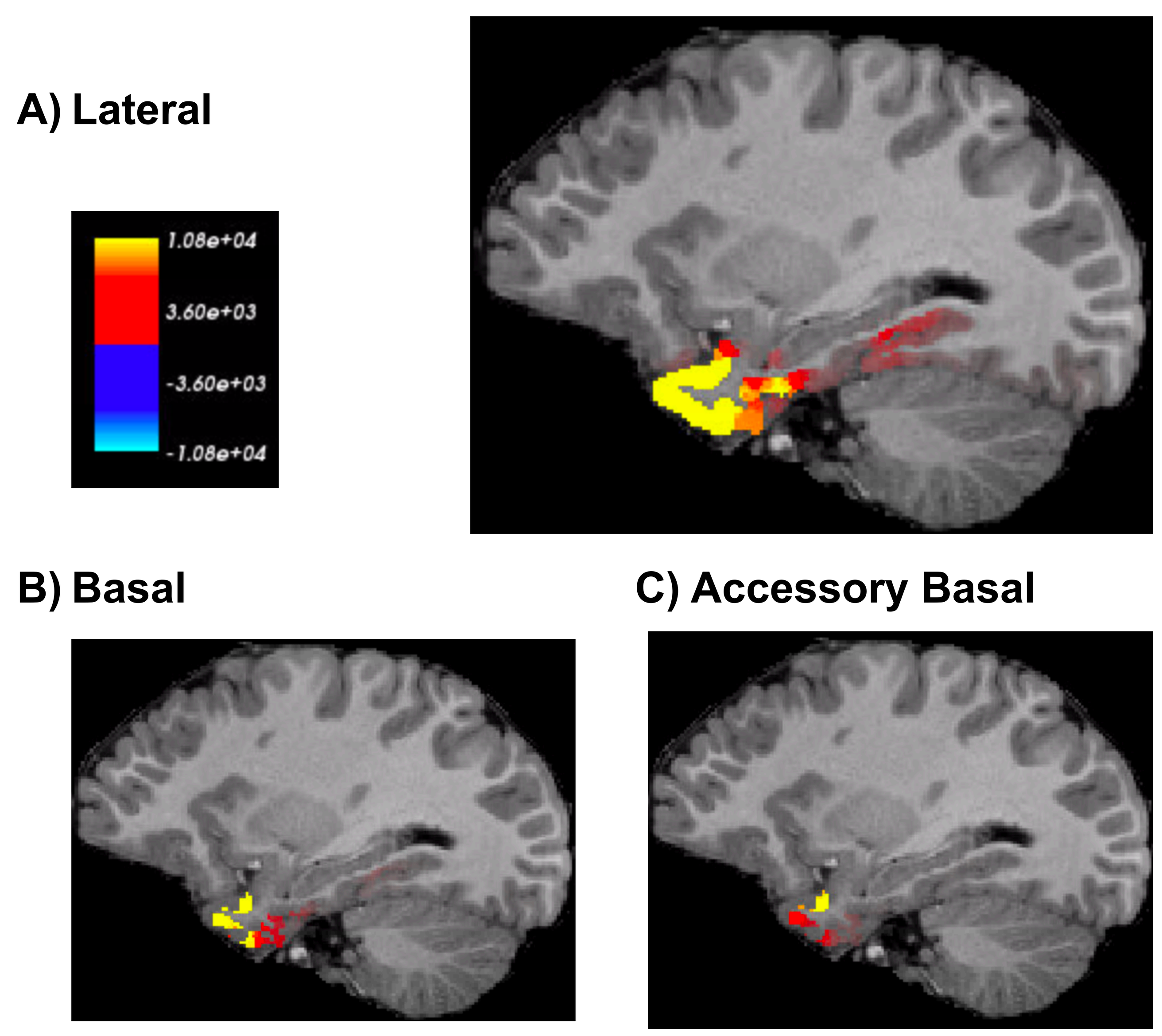


Figure 2: Kids (N=27)

Connectivity gradient between each subnucleus of the amygdala and the occipitotemporal cortex, averaged across all kid subjects



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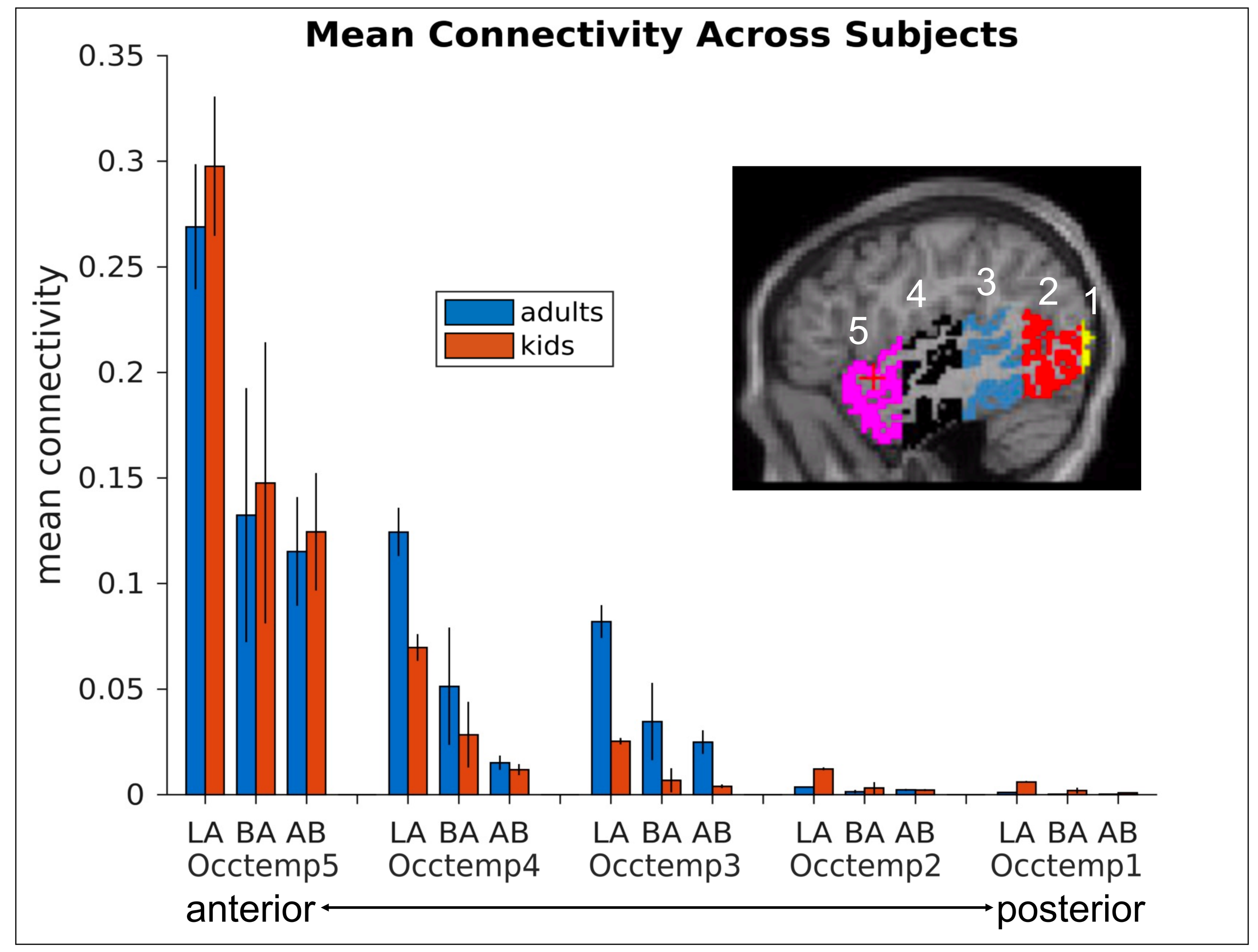
RESULTS

Figure 3

Mean connectivity across subjects between each subnucleus of the amygdala and the occipitotemporal cortex, averaged across hemispheres



Main effects:

- Connectivity was significantly different from each subnucleus, $F(2) = 78.98$, $p < 0.0001$
- Connectivity was significantly different to each of the 5 occtemp labels, $F(4) = 263.35$, $p < 0.0001$

Interactions:

- There was a significant interaction between sample (i.e., adults vs. kids) and occtemp label, $F(4) = 5.98$, $p = 0.016$
- There was a significant interaction between subnucleus and occtemp label, $F(8) = 21.13$, $p = 0.0001$

CONCLUSIONS

- Connectivity between the amygdala subnuclei and the occipitotemporal cortex in humans seems to exist on a gradient with decreasing connectivity moving from anterior to posterior, resembling that of Macaques. However, there appears to be less connectivity in humans to early visual areas (e.g., V1).
- There was not a significant main effect between adults and kids, but there was an interaction between sample and occtemp label, supporting Webster et al.'s conclusion that connections become more refined across development.

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