*Nature Reviews Neuroscience* | Published online 25 Aug 2016; doi:10.1038/nrn.2016.123


# Connecting with words

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Different regions of the cortex have distinct functional profiles, but how such functional specificity develops is not clear. One possible explanation — the connectivity hypothesis — proposes that the pattern of connectivity within a particular cortical area (its 'connectivity fingerprint') may determine its eventual function. In support of this hypothesis, a new longitudinal study by Kanwisher and colleagues shows that cortical connectivity fingerprints in 5-year-old children who have not yet learnt to read can predict the location of the so-called visual word form area (VWFA) in the same children 3 years later, once they have learnt to read.

The VWFA lies in the left ventrolateral cortex and, in people who have learnt to read, responds selectively to written words in the learnt language. In this study, the authors scanned 31 children at 5 years of age (Y5), and again at Y8; around half of the children had been unable to read when they were aged 5 (NR-R), whereas the others could already read at this age (R-R). By Y8, all the children could read, and most children (29 of 31) exhibited a definable VWFA with responses selective for words over faces, scrambled words or images of objects.

The authors tested whether the cortical area that would become the VWFA in NR-R children showed any early selectivity for letters at Y5. Using functional MRI data, they mapped each Y8-defined VWFA onto the same individual's Y5 scan, to delineate the areas that would become VWFAs. These areas showed selectivity for letters over faces at Y5 in the R-R children, but not in the NR-R children, suggesting that the selectivity of the VWFA for letters only develops when learning how to read.

Next, the authors investigated whether early connectivity data — from Y5 diffusion-weighted scans from 11 of the NR-R children — could predict later cortical function. Through this approach, they were able to train a model to use Y5 connectivity profiles for each voxel in the left occipitotemporal cortex to predict the responsivity of the same voxel at Y8 — and thus the location of the VWFA. Strikingly, the predicted VWFAs spatially overlapped with the actual VWFAs by 64% and were on average only 1.3 mm away, suggesting that connectivity can indeed quite accurately predict future function.

Finally, the authors used tractography to reveal that, at Y5, the regions that were to become VWFAs had different connectivity profiles to those of neighbouring areas. For example, compared with the left fusiform face area (which responds to faces, even at Y5), the future-VWFA region was more highly connected with left-hemisphere temporal and frontal regions — possibly reflecting the involvement of these areas in language. Thus, the connectivity of the future VWFA differs to that of surrounding regions, even before functional specificity arises.

This study provides evidence that the pattern of early connectivity fingerprint of a brain structure may predict the future functional specificity of that structure. Further studies could help to elucidate how connectivity fingerprints themselves are formed.

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**ORIGINAL ARTICLE** Saygin, Z. M. *et al.* Connectivity precedes function in the development of the visual word form area. *Nature* http:dx.doi.org/10.1038/nn.4354 (2016)
**FURTHER READING** Dehaene, S. *et al.* Illiterate to literate: behavioural and cerebral changes induced by reading acquisition. *Nat. Rev. Neurosci.* **16**, 234–244 (2015)