Brain activity during working memory in congenital adrenal hyperplasia

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ESPE 2021 The 59th Annual Meeting Online 22-26 September 2021

INTRODUCTION

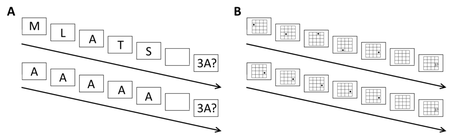
- The disrupted cortisol rhythm, in addition to other physiological challenges in CAH might affect the developmental trajectory of the brain
- Patients have been found to have problems with working memory (WM)[1] and reduced cortical thickness in regions of the working memory brain network in adulthood[2]
- These changes might be accompanied by changes in brain activity during working memory

AIM

- We aimed to compare working memory related brain activity between patients with CAH and healthy controls
- We also tested the modulating effect of sex

METHOD

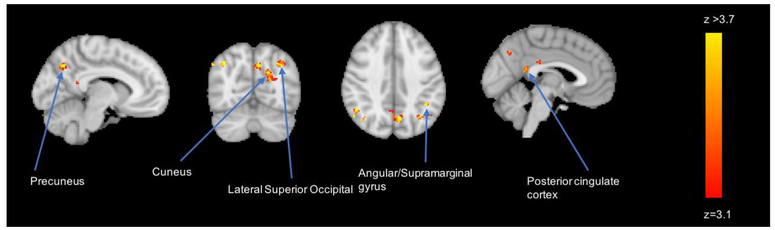
- 29 patients with CAH (17 female) and 40 Controls (24 female), aged 16-33 years
- Participants underwent MRI 3T functional brain scanning while performing a verbal and visuo-spatial working memory task



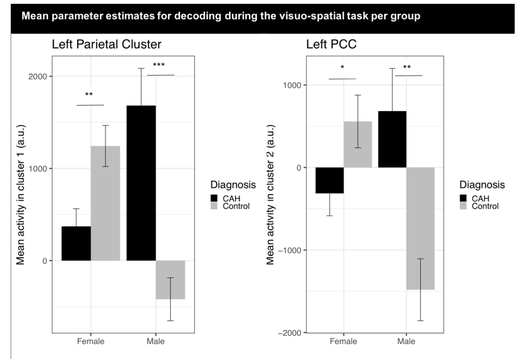
During the tasks, participants memorized (encoding) a sequence of five letters (A), or the location of dots in a grid (B), and were then probed for the position in the sequence of one of the items (decoding).

RESULTS

- Working memory related brain activity was assessed by comparing activity during the encoding and decoding phases to activity during control conditions
- There were no differences in brain activity between CAH and controls during any of the WM tasks on a whole group level
- Sex-dependent effects were found only during the decoding phase of visuo-spatial working memory:
  - Males with CAH showed stronger activity in regions of the left dorsal visual stream compared to male controls
  - Females with CAH showed reduced activity in these areas compared to female controls
- There were no relationships between brain activity and performance (accuracy or reaction time) on this task in any of the groups



During the decoding phase of the visuo-spatial working memory task, a significant interaction between group (CAH; control) and sex (male; female) was found for activity in regions of the left dorsal stream, including the left parietal, superior occipital and posterior cingulate cortex. Red-yellow indicates increased activity; the more yellow indicates a greater z-score (i.e. a lower p-value).



Mean brain activity during decoding per group, per sex for the left posterior cingulate cortex (PCC) and the left parietal cluster (precuneus, cuneus, lateral superior occipital and angular/supramarginal gyrus grouped together).
A.u.=arbitrary unit. ***=p<0.001, **=p<0.01, p*=p<0.05

CONCLUSIONS

- CAH does not seem to have a major impact on the functional brain responses during working memory at adult age, for this specific task
- The similar level of activity in the presence of reduced cortical thickness suggests patients' brains are able to compensate well during certain tasks
- However, activity of the left dorsal visual stream might be affected depending on sex
- Future multi-modal analyses will investigate the relationship between brain structure and function during working memory in patients with CAH

REFERENCES

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ACKNOWLEDGEMENTS

We thank Dr Malin Thomsen Sandberg and Licensed psychologist Anton Gezelius for patient recruitment and testing.

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