Hearing, language and communication abilities in children with congenital hypothyroidism

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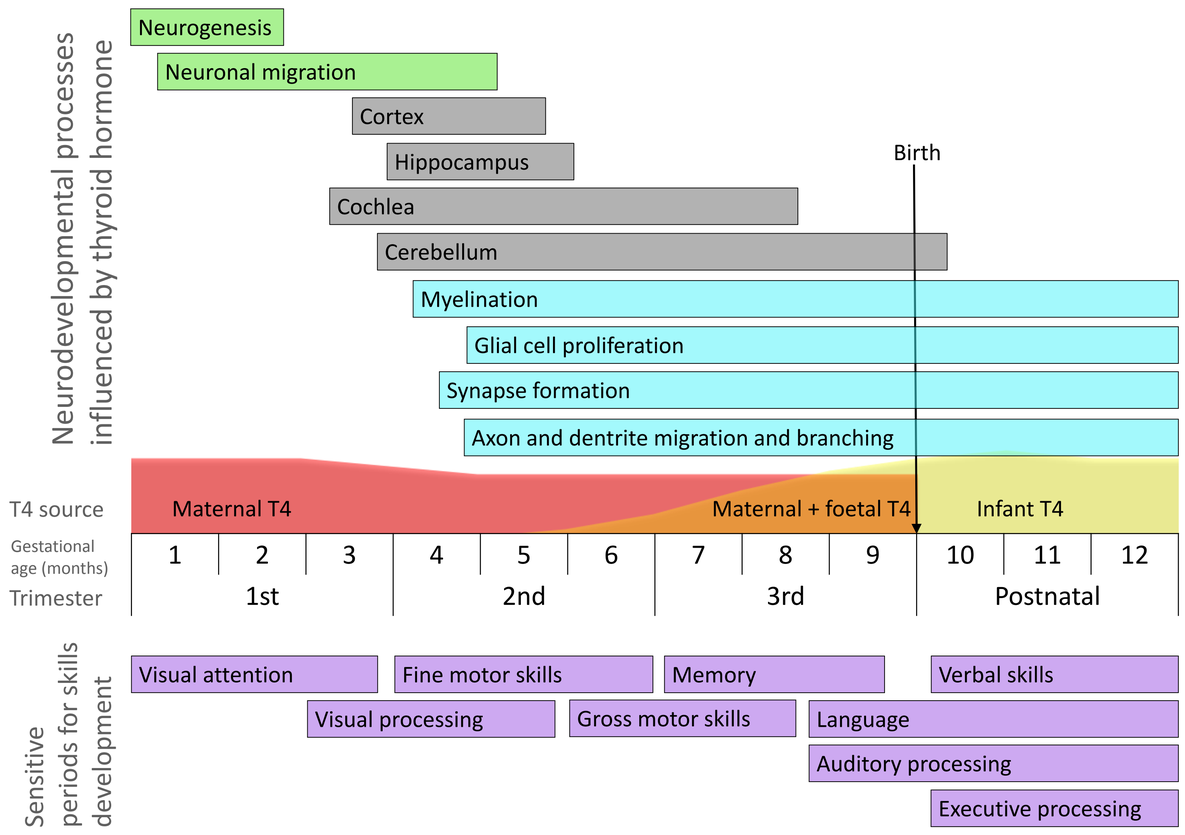
Introduction: Thyroid hormones are essential in the regulation of foetal and post-natal neurodevelopment. Despite early diagnosis and treatment of congenital hypothyroidism (CH), difficulties with language, hearing, memory and motor function persist for some children. However, comprehensive data about hearing, language and communication function in children with CH are not widely available.

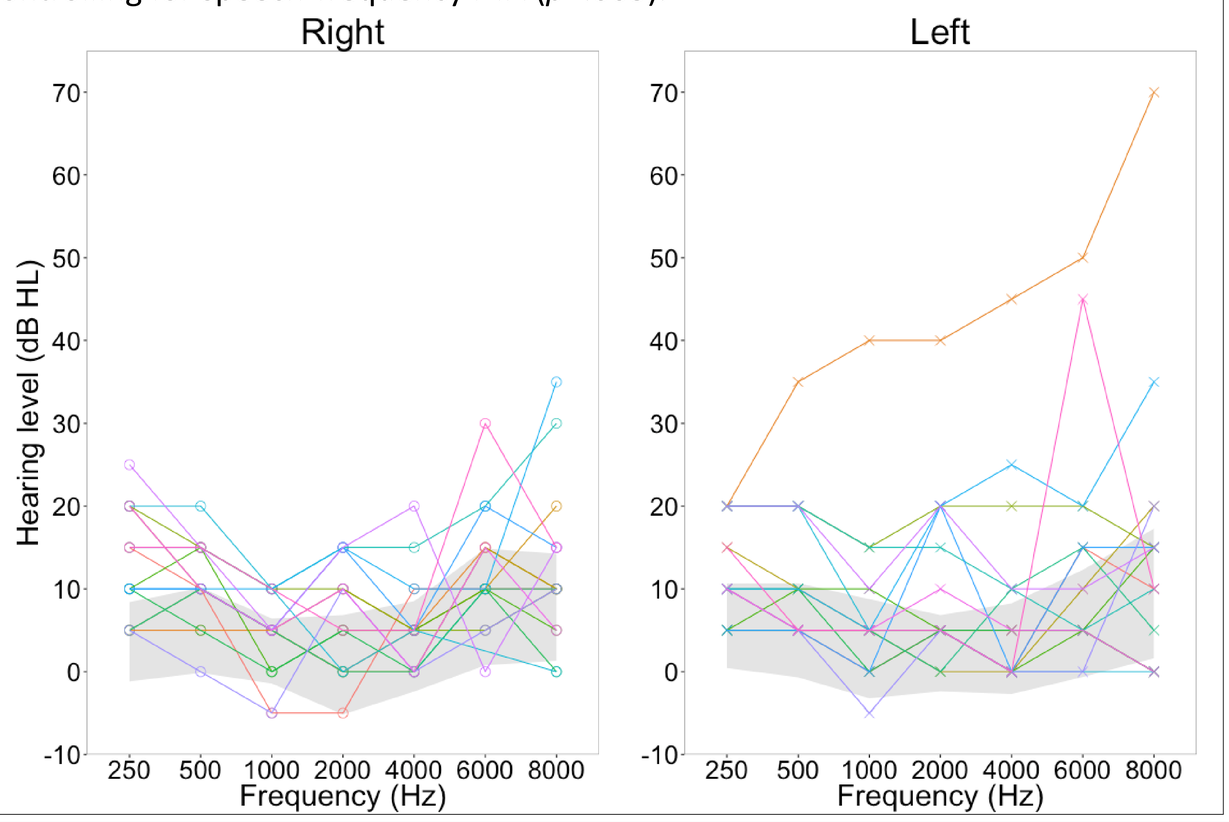


Objectives: to evaluate hearing, language and communication development in children with severe, early treated CH.

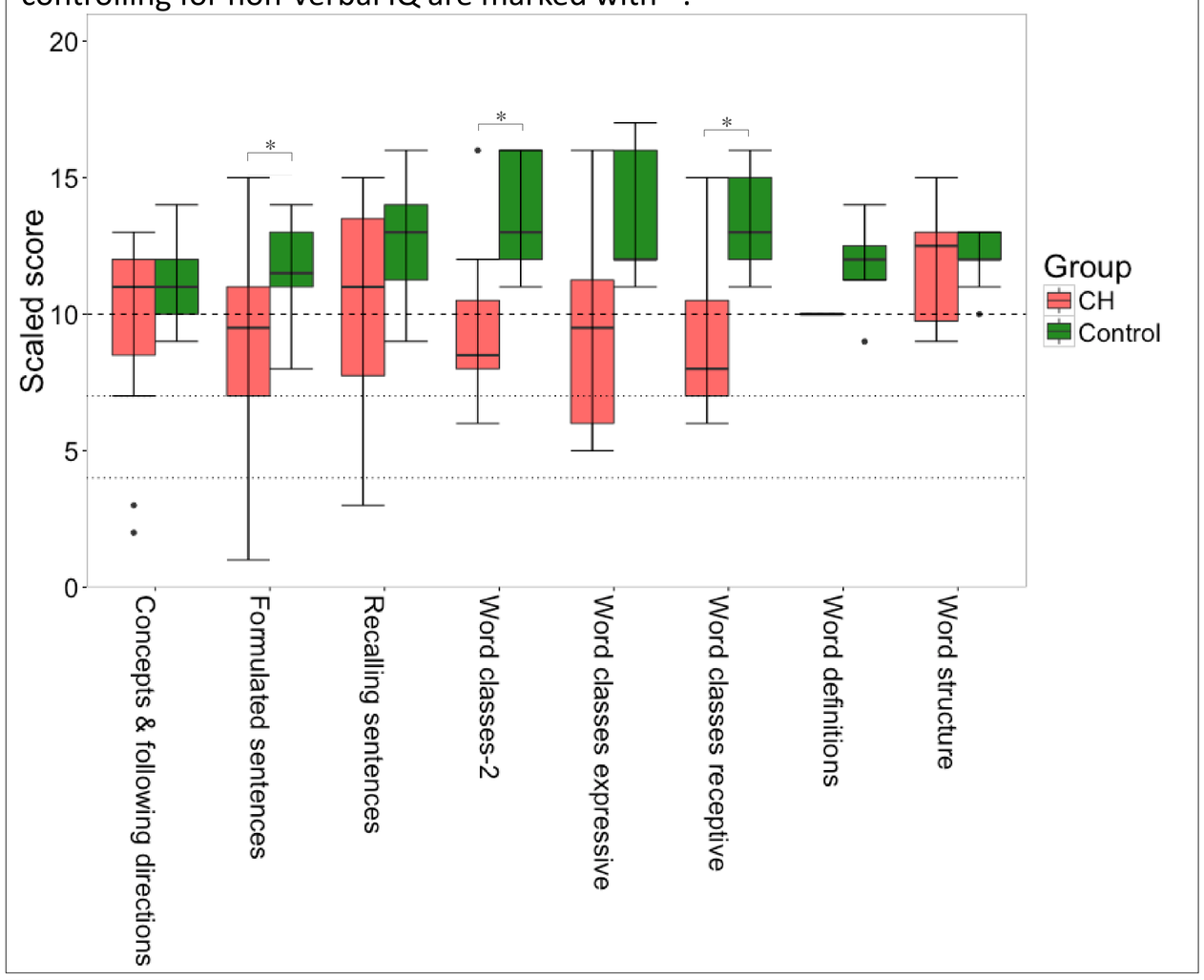
Participants: Thirty-four children age 6-16 years took part in the study. Sixteen had CH and 18 were typically developing controls. Those with CH were identified through new-born screening and all had TSH >375mU/L and T_4 <3.9pmol/L at diagnosis. Radioisotope scans showed that 14 had agenesis of the thyroid gland and two had dyshormonogenesis. All began thyroxine treatment within the first month of life and remained on treatment at the time of testing.

Methods: Participants' hearing was evaluated using pure-tone audiometry (PTA) and speech-in-noise testing. The Clinical Evaluation of Language Fundamentals (CELF-4) was carried out to examine language function. The Children's Communication Checklist (CCC-2) was completed by parents to assess communication using general communication (GCC) and social interaction deviance (SIDC) composite scores.

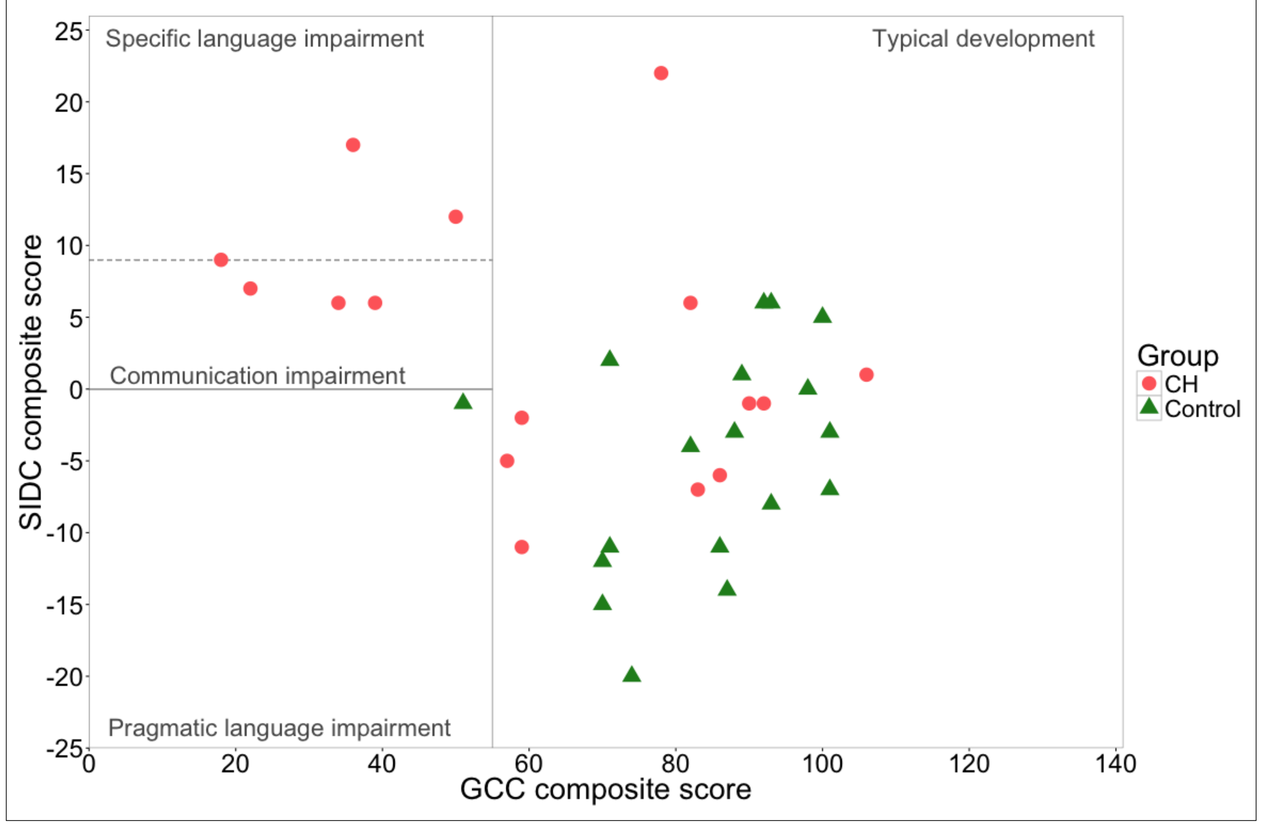
Hearing: All children in the control group had clinically normal PTAs. Detection thresholds are shown here for individual CH participants with control mean ± 1 SD shown in the shaded area. Speech-frequency PTA was significantly worse for the CH group compared to controls and 19% of the CH group had a clinical hearing loss. Speech-in-noise testing was also significantly worse for the CH group when controlling for speech-frequency PTA (p=.003).



Language: Core language measures were significantly poorer for the CH group compared to controls. Much of this difference was driven by IQ differences with the CH group also displaying significantly worse non-verbal IQ scores. Box plots of CELF-4 individual measures are illustrated here with the dashed line showing the scale mean and the dotted lines representing one and two standard deviations below the scale mean. Scores which were significantly different (p<.05) when controlling for non-verbal IQ are marked with *.



Communication: The CCC-2 general communication composite score was significantly lower for the CH group (p=.015) and 38% of children with CH were rated as having clinically significant communication problems. Composite scores are shown here with dividing lines separating typical development and impaired communication.



Discussion

- Many children with severe, early treated CH develop age appropriate hearing, language and communication skills.
- However, it is important to recognise that a subset of children with CH may continue to experience difficulties in several areas of development despite early identification and treatment.
- Future work includes further evaluation of neurodevelopment using MRI data (including diffusion and resting-state fMRI) collected from the same cohort.

References: Zoeller, R.T. and J. Rovet, *Timing of thyroid hormone action in the developing brain: clinical observations and experimental findings.* J Neuroendocrinol, 2004. **16**(10)
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Thyroid
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