Sex differences and asymmetries in cortical thickness within the speech production network

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INTRODUCTION

• Neural processing of speech production has been traditionally attributed to the left hemisphere.
  
• However, recent studies have challenged this notion by reporting bilaterally distributed large-scale network interactions during speech production (Simonyan and Fuertinger, 2015; Kumar et al., 2016).
  
• It remains unclear if there are structural bases for speech functional lateralization and if these may be partially explained by sexual dimorphism of cortical morphology.

RESULTS

• Females showed greater CT of the left Heschl's gyrus when compared to males.
  
• Males showed rightward asymmetry of the superior temporal gyrus.
  
• Both males and females showed rightward asymmetry of the supramarginal gyrus and leftward asymmetry of the precentral gyrus.

CONCLUSION

• Sexual dimorphism of the Heschl's gyrus may underlie differences in auditory processing for speech production between females and males.
  
• Asymmetries within cortical areas involved in speech motor execution and planning may contribute to the hemispheric localization of functional activity and connectivity of these regions within the speech production network.
  
• Our findings highlight the importance of consideration of sex as a biological variable in studies on neural correlates of speech control.

METHODS

• A total of 109 healthy subjects (age-matched 59 females/50 males) underwent structural MRI on 3T scanner. In addition, 16 females and 14 males completed fMRI during speech production.
  
• Cortical thickness (CT) and speech fMRI analysis were performed using standard FreeSurfer and AFNI pipelines.
  
• Following identification of speech-related brain activity, regions of interest for CT analysis were restricted to functional activation maps within brain regions involved in speech control (Tourville et al., 2003; Simonyan et al., 2016; Kearney and Guenther, 2019) (Fig 1).

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