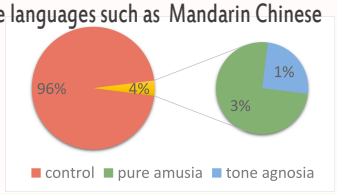
The mechanism of spoken word processing: Insights from congenital amusia

Ting Huang, Yun Nan, Yu-Xuan Zhang*
National Key Laboratory of Cognitive Neuroscience and Learning, Beijing Normal University, Beijing, China
* zhangyuxuan@bnu.edu.cn

1 BACKGROUND

- Pitch is not only a fundamental attribute of music but also is critical in speech sounds, especially for tone languages such as Mandarin Chinese
- Congenital amusia is a lifelong disorder of musical abilities, characterized by deficits in pitch perception
- One third of Chinese amusics also suffer from poor tone perception (tone agnosia)
- However, whether and how the pitch deficits of Chinese amusics relate to cognitive functions and speech perception remain unknown



2 AIM

- Examine how perceptual (pitch) ,cognitive (working memory) and speech deficits interact in Chinese amusics

3 METHOD&RESULTS

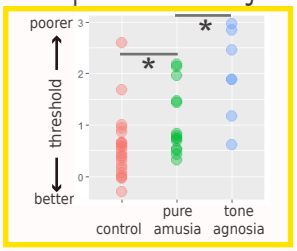
Subjects

Native Chinese speakers divided into:
- amusics(N=21)
  - pure-amusia group (N=14)
  - tone-agnosia group (N=7)
- normal controls (N=22)

Tasks:
- pitch perception (tone frequency discrimination)
- working memory (auditory and visual N-back)
- speech perception (monosyllable word same/different classification)

Pitch Perception

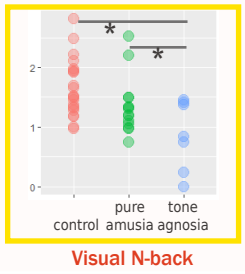
control > pure amusia >tone agnosia



Working Memory

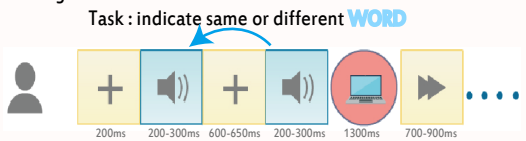
control > pure amusia ,tone agnosia

control,pure amusia > tone agnosia

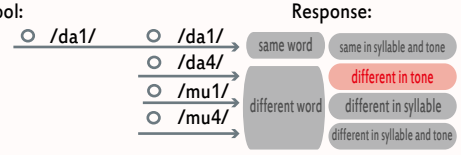


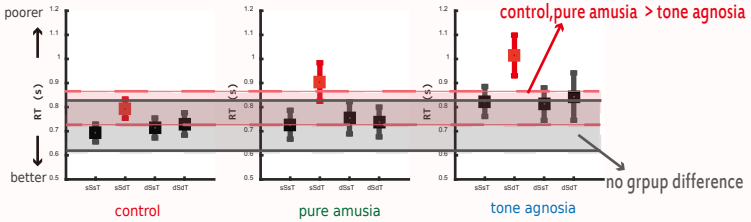
Speech Perception

Paradigm:



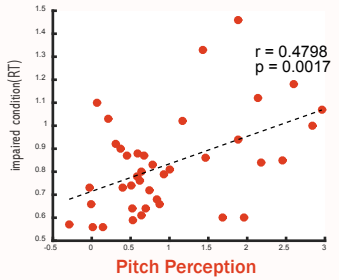
Stimulus Pool:



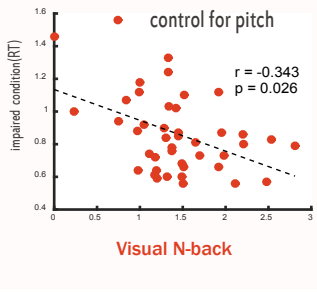


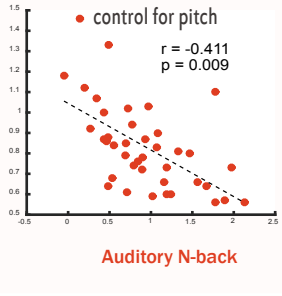
The speech perception impairment of the tone agnosia group only manifest when the two words differ only in tone (the condition in red)

Correlation



Word Classification on the impaired condition(only tone difference) correlated significantly with :
- pitch perception(above)
- visual and auditory working memory scores even when controlling for pitch perception (below)





4 CONCLUSION

- Chinese amusics show working memory impairment
  - pure-amusia group : auditory specific
  - tone-agnosia group : domain general
- Word perception impairments of the tone-agnosia group
  - mainfest when words differ only in tone
  - relate to perceptual (pitch) and cognitive (working memory)