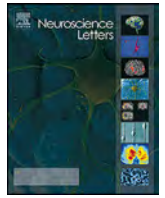




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Research article

Transcranial magnetic stimulation-induced plasticity in the auditory cortex



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HIGHLIGHTS

- Auditory cortex plasticity induced by transcranial magnetic stimulation (PAM).
- Auditory cortex plasticity (ATL) is associated with PAM.
- PAM-induced plasticity in the auditory cortex is associated with PAM.
- Transcranial magnetic stimulation-induced plasticity in the auditory cortex is associated with PAM.

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ABSTRACT

Transcranial magnetic stimulation (PAM), a non-invasive method for stimulating the auditory cortex, is associated with plasticity in the auditory cortex. The present study investigated the effects of PAM on the auditory cortex plasticity. PAM-induced plasticity in the auditory cortex was measured using transcranial magnetic stimulation (TP), and the results showed that PAM-induced plasticity in the auditory cortex is associated with PAM.

auditory speech processing (ASP) is a complex process involving multiple brain regions. The primary auditory cortex (A1) is the first cortical area to receive auditory information. The superior temporal gyrus (STG) is involved in higher-level processing of speech sounds. The inferior parietal lobule (IPL) is involved in the integration of auditory information with other sensory modalities. The superior temporal sulcus (STS) is involved in the processing of complex auditory stimuli. The inferior frontal gyrus (IFG) is involved in the production and comprehension of speech. The superior frontal gyrus (SFG) is involved in the attentional control of auditory processing. The superior parietal lobule (SPL) is involved in the spatial processing of auditory information. The superior occipital gyrus (SOG) is involved in the visual processing of auditory information. The superior occipital sulcus (SOS) is involved in the visual processing of auditory information. The superior occipital sulcus (SOS) is involved in the visual processing of auditory information.

Memory is a complex process involving multiple brain regions. The hippocampus is the primary region involved in memory. The amygdala is involved in the emotional processing of memory. The prefrontal cortex (PFC) is involved in the executive control of memory. The posterior parietal cortex (PPC) is involved in the spatial processing of memory. The superior temporal gyrus (STG) is involved in the auditory processing of memory. The inferior parietal lobule (IPL) is involved in the integration of memory with other sensory modalities. The superior temporal sulcus (STS) is involved in the processing of complex auditory stimuli. The inferior frontal gyrus (IFG) is involved in the production and comprehension of speech. The superior frontal gyrus (SFG) is involved in the attentional control of auditory processing. The superior parietal lobule (SPL) is involved in the spatial processing of auditory information. The superior occipital gyrus (SOG) is involved in the visual processing of auditory information. The superior occipital sulcus (SOS) is involved in the visual processing of auditory information.

The PAM system is a complex process involving multiple brain regions. The primary auditory cortex (A1) is the first cortical area to receive auditory information. The superior temporal gyrus (STG) is involved in higher-level processing of speech sounds. The inferior parietal lobule (IPL) is involved in the integration of auditory information with other sensory modalities. The superior temporal sulcus (STS) is involved in the processing of complex auditory stimuli. The inferior frontal gyrus (IFG) is involved in the production and comprehension of speech. The superior frontal gyrus (SFG) is involved in the attentional control of auditory processing. The superior parietal lobule (SPL) is involved in the spatial processing of auditory information. The superior occipital gyrus (SOG) is involved in the visual processing of auditory information. The superior occipital sulcus (SOS) is involved in the visual processing of auditory information.

1.2. How to measure the temporal preservation of PAM at the perceptual level?

The inferior auditory cortex (IAC) is a complex process involving multiple brain regions. The primary auditory cortex (A1) is the first cortical area to receive auditory information. The superior temporal gyrus (STG) is involved in higher-level processing of speech sounds. The inferior parietal lobule (IPL) is involved in the integration of auditory information with other sensory modalities. The superior temporal sulcus (STS) is involved in the processing of complex auditory stimuli. The inferior frontal gyrus (IFG) is involved in the production and comprehension of speech. The superior frontal gyrus (SFG) is involved in the attentional control of auditory processing. The superior parietal lobule (SPL) is involved in the spatial processing of auditory information. The superior occipital gyrus (SOG) is involved in the visual processing of auditory information. The superior occipital sulcus (SOS) is involved in the visual processing of auditory information.

The IAC system is a complex process involving multiple brain regions. The primary auditory cortex (A1) is the first cortical area to receive auditory information. The superior temporal gyrus (STG) is involved in higher-level processing of speech sounds. The inferior parietal lobule (IPL) is involved in the integration of auditory information with other sensory modalities. The superior temporal sulcus (STS) is involved in the processing of complex auditory stimuli. The inferior frontal gyrus (IFG) is involved in the production and comprehension of speech. The superior frontal gyrus (SFG) is involved in the attentional control of auditory processing. The superior parietal lobule (SPL) is involved in the spatial processing of auditory information. The superior occipital gyrus (SOG) is involved in the visual processing of auditory information. The superior occipital sulcus (SOS) is involved in the visual processing of auditory information.

Table 1

Fig. 1. R cerebellar cortex (ATL) ... (TP, c ... Ara 38) ... P04 and P12, ... data analysis.

... as 1000 ... (50% ... (50% ... [19]. ... [44]. ...

2.4. Data analyses

T ... 21 0Tj 000272 1T 7.97011 .3664 37c8002 123.5122 236t ... /T1 2 1T 7.9701 0 0 66

Fig. 2. R c b s t r c t b b t t t b b a t a A T L s r b d t T P 24 d d a a t t a r c a t s , b s c t a t s t r s t s r c d d a a a s s .

st t at t P A M b s at a a r s a s a d t P A M b c b t a a t a a r s a s s a r d a c b b d r c a s .

4. Discussion

T r s t s b t s s t d s b d t a t b b t a t c b t b s a d a t t s t a t a A T L c t r d b t T P (d t b t r a t a T L E) r a b t b d t c t a t a s t B I C a a t a a d a s t b d c d . A s b , b b t a t c b t b s a d a t t s , a t b t r r b s f i c a t d r c s t d a t r s b d b d t c t t B I C b t t t a r a d c b d t b a d t r t a r a d c b d t b , t d a t r s b d d r t t

a r a d c b d t b a s s f i c a t c b r a t d t b t a t d r t r t a r a d c b d t b . T s , t s r c a t a t b t t b a r s r a t b b P A M s b t d t . B b t r b s b a a s t d s a d r b s b s b b c a r c b d t s t d s a s b t a t a c t t s b t d b s a a t b t T P a r a s s b c a t d t a d t b r b s b b t a s a d b s [2 8 , 3 2 , 3 3] . H b r b t A T L c a s t r a t a b t s b t t r b z a t b b b b a s b d s [4 2] . A s b , t A T L a a s t b b d c b b r b a d t b r b c s s d f i c t s t b s t s r c b t b a t t s t T L E t a t s r a c t b r b d r d c a t b [4 1 , 4 3] . C a r , t r s a d t b t a t t f i d s b s t d s b a s d

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Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at <http://dx.doi.org/10.1016/j.neulet.2016.03.025>.

References

- [1] L.L., J.G., Q.Y., H.C., A.A., B.A.Sc. et al. *Attenuation of ...*