INTRODUCTION

- Imaging and EEG are typically used to investigate hemispheric activity. However, these techniques require specialized knowledge, can be costly, and are time consuming.
- Interestingly, the tympanic membranes are perfused by the same cardiovascular system, which perfuses the cortex, and increased warmth in one versus the other tympanic might indicate increased hemispheric activity on the contralateral side following cognitive tasks (e.g., Cherbuin & Brinkman, 2004).
- Unilateral manual activity has been demonstrated, via EEG, to increase contralateral hemispheric activation, with unimanual left hand contractions resulting in increased right hemisphere activity and unimanual right hand contractions resulting in increased activity of the opposite hemisphere (e.g., Harmon-Jones, 2006).
- We therefore examined whether left-right differences in tympanic membrane temperature (l-rTMT) can indicate hemispheric activation following unilateral manual stimulation.

METHOD

Participants: As part of a larger protocol, Consistently-Right (CRH; Edinburgh Handedness Inventory of +85 and above) and Inconsistently-Handed (ICH; Edinburgh Handedness Inventory -80 to +80) individuals were randomly assigned to Hand Clench Condition (HCC): Left (CRH n=20, ICH n=24) or Right (CRH n=24, ICH n=20) hand clenching, Bilateral clenching (CRH n=20, ICH n=17), or No clenching control (CRH n=21, ICH n=20).

Clenching consisted of 2 sets of squeezing a 5 cm diameter ball as hard as possible for 45 seconds followed by a 15 second rest period. Immediately following HCC, participants’ TMT were measured using a Braun Thermoscan Pro 4000.

RESULTS

- A 4 (Hand Clench Condition) x 2 (CRH versus ICH) ANOVA on l-rTMT revealed no main effect or interaction of Hand Clench Condition (p>.1).
- A main effect of Handedness revealed significantly decreased l-rTMT in ICH compared to CRH regardless of Hand Clench Condition (f(1,158)=4.59, p<.05). See Figure 1.
- Analyses of simple effects revealed warmer right versus left TMT in ICH (p<.01). See Figure 2.

DISCUSSION

- Handedness differences in l-rTMT regardless of HCC suggests that some TMT measures may reflect stable trait individual differences in hemispheric activity, rather than state differences.
- Interestingly, previous work from our lab (Propper et al., 2010) also reported Handedness differences in a measure of TMT, though those results suggested increased difference in activity between the hemispheres in ICH, regardless of which hemisphere was more or less active.
- Clearly, TMT-hemispheric activity-behavior relationships are influenced by many factors, and deserving of further investigation.
- Suggestions for future research include the use of EEG in conjunction with TMT in order to ensure that HCC had an effect on hemispheric activity as expected.
- Lastly, TMT measures are a promising means by which the activity of the cerebral hemispheres, and their relationships with behavior, may be investigated non-invasively and with minimal training and cost.

REFERENCES


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