Reproducibility of the simple cerebrovascular breath hold responses measured using transcranial color-coded doppler sonography?  
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INTRODUCTION

- Cerebral arteries are sensitive to fluctuations in carbon dioxide (CO₂), and ageing and disease attenuates this sensitivity
- CO₂ reactivity measured using end-tidal forcing, rebreath, or during breath hold is a measure of cerebrovascular health

METHODS AND MATERIALS

Participants:
- Subjects (n=6) (age 29 ± 10) visited the Cerebrovascular health and exercise research sciences (CHEERS) laboratory and completed two experimental sessions. Each session was separated by a minimum of 24 hours. Subjects were asked to refrain from caffeine, alcohol, and exercise for up to 12 hours prior. Chronic smoking and recreational drug use, as well as known cardiorespiratory, cerebrovascular, and metabolic disorders were exclusion criteria.

Procedure:
- Cerebral anatomy was measured/monitored using TCCS and edge detection software
- Simple breath hold test was performed following a 30 second resting baseline measure, following by 30 seconds of hyperventilation, prior to a 30 second breath hold at normal inspiratory tidal volume, finishing with a 30 second recovery breathing period. (see image below)

RESULTS

Figure 2. Changes from baseline in diameter (panel a.), velocity (panel b.), and blood flow (panel c.) of the left (n=5) and right (n=1) middle cerebral artery for day 1 and day 2 testing of each individual subject. Colored dots and mean average (blue line). No significant changes occurred from baseline and through breath hold test for each hemodynamic measure.

CONCLUSION

Despite diameter, velocity, and flow measures being difficult to obtain, the TCCS is reliable tool to measure changes in cerebral vascular activity during a simple breath hold response test

REFERENCES


DISCUSSION

- Between day resting diameter, velocity, and blood flow values were reasonably reliable using Ttest measures to compare central tendency differences.
- Between day diameter breath hold responses appear to be more reliable compared to velocity measures
- Blood flow reliability during breath hold response testing appear to be dependent on degree of hyperventilation

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