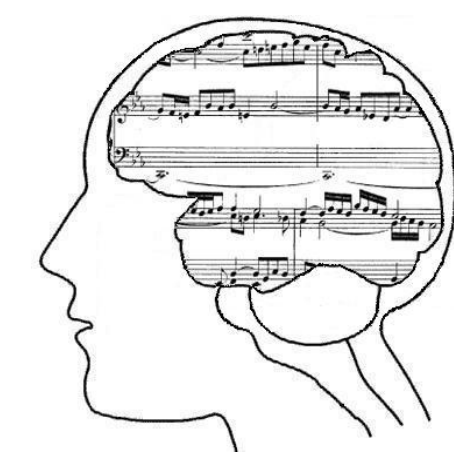


## INTRODUCTION

- Older adults experience a decline in inhibitory control.
- These declines have been implicated in instrumental activities of daily living.
- Previous studies have revealed that older musicians have behavioral and neurophysiological enhancements in various cognitive and motor domains compared to non-musicians.
- This suggests that music training may delay the decline in cognitive and motor inhibition with aging.



## PURPOSE & HYPOTHESES

The **aim** of this study was to determine differences in cognitive and motor inhibition in older and young musicians and non-musicians.

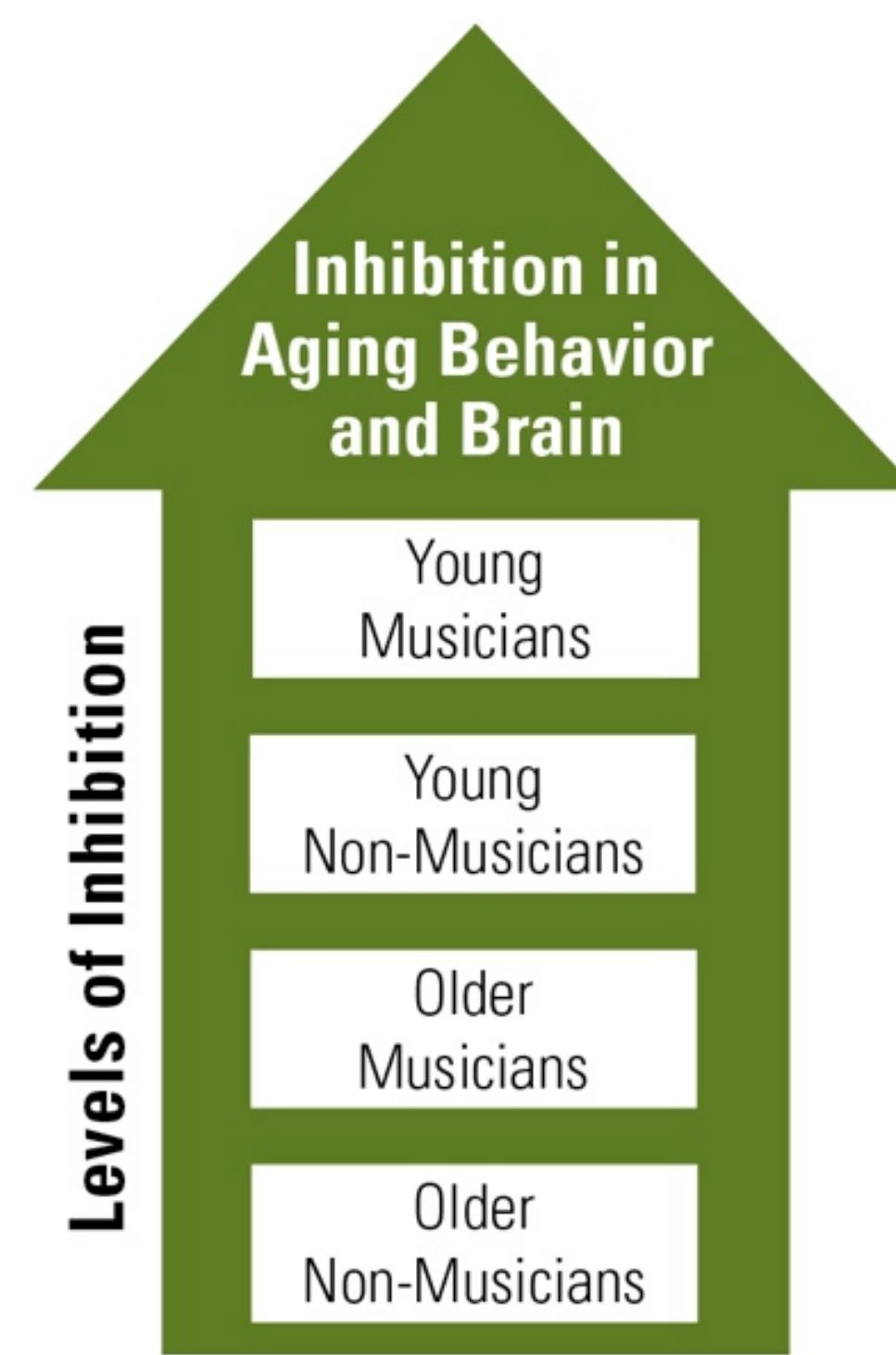


Figure 1. Visual representation of hypotheses.

## PARTICIPANT DEMOGRAPHICS

Cognitive Inhibition	HYA Musicians	HYA Non-Musicians	HOA Musicians	HOA Non-Musicians
Sample Size	22	19	24	20
Gender	36% (F), 63% (M)	63% (F), 37% (M)	63% (F), 37% (M)	35% (F), 65% (M)
Age	21 (± 3)	23 (± 4)	70 (± 6)	71 (± 3)
Ethnicity	64% Caucasian 27% Asian 9% Mixed	52% Caucasian 21% Asian 16% African American 11% Latino	100% Caucasian	100% Caucasian

Motor Inhibition	HYA Musicians	HYA Non-Musicians	HOA Musicians	HOA Non-Musicians
Sample Size	19	16	13	16
Gender	37% (F), 63% (M)	63% (F), 37% (M)	62% (F), 38% (M)	38% (F), 62% (M)
Age	20 (± 3)	23 (± 5)	67 (± 5)	71 (± 4)
Ethnicity	68% Caucasian 21% Asian 11% Mixed	56% Caucasian 19% African American 13% Latino 12% Asian	100% Caucasian	100% Caucasian

## DATA COLLECTION AND ANALYSIS

### Cognitive Inhibition Data Collection:

- A computerized Stroop task was performed using E-Prime 2.0 (Psychology Software Tools, Pittsburgh, PA) (Figure 2).
- Electroencephalography (EEG) signals were recorded from a montage of 64 scalp-surface electrodes during movement conditions and during rest (Figure 3).

**Blue**

Figure 2. Example of incongruent condition.

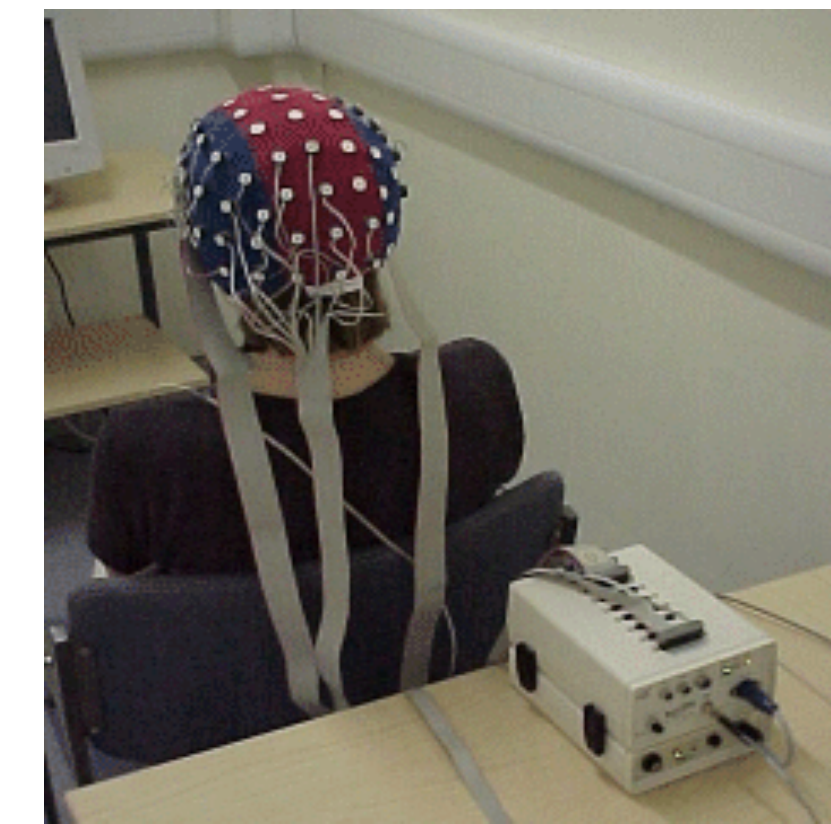


Figure 3. EEG setup.

- Data collected from electrodes F3, F4, Fz, Cz, and Pz was used for P300 event-related potential (ERP) analysis using MATLAB EEG Lab.

### Motor Inhibition Data Collection:

- Participants were asked to perform an index finger flexion-extension movement (i.e., finger tap) in sync with an auditory tone (i.e., synchronized) and between auditory tones (i.e., syncopated) presented at 1 Hz (Figure 4).
- Ten single-pulse (SP) transcranial magnetic stimulation (TMS) and short latency intracortical inhibition (SICI) pulses were collected for each condition (i.e., rest, synchronized tapping, syncopated tapping).
- MEP (i.e. muscle twitch) was recorded from the first dorsal interosseous (FDI) using bipolar surface electromyography (EMG).



Figure 4. Finger tapping setup.

### Statistical Analysis:

- A 2 (HYA, HOA) x 2 (musician, non-musician) ANOVA was completed to determine differences in: 1) Stroop task accuracy & reaction time, 2) P300 latency & amplitude, 3) finger tapping accuracy & difference, 4) MEP amplitude. Significance was set at  $\alpha = 0.05$ .

## RESULTS

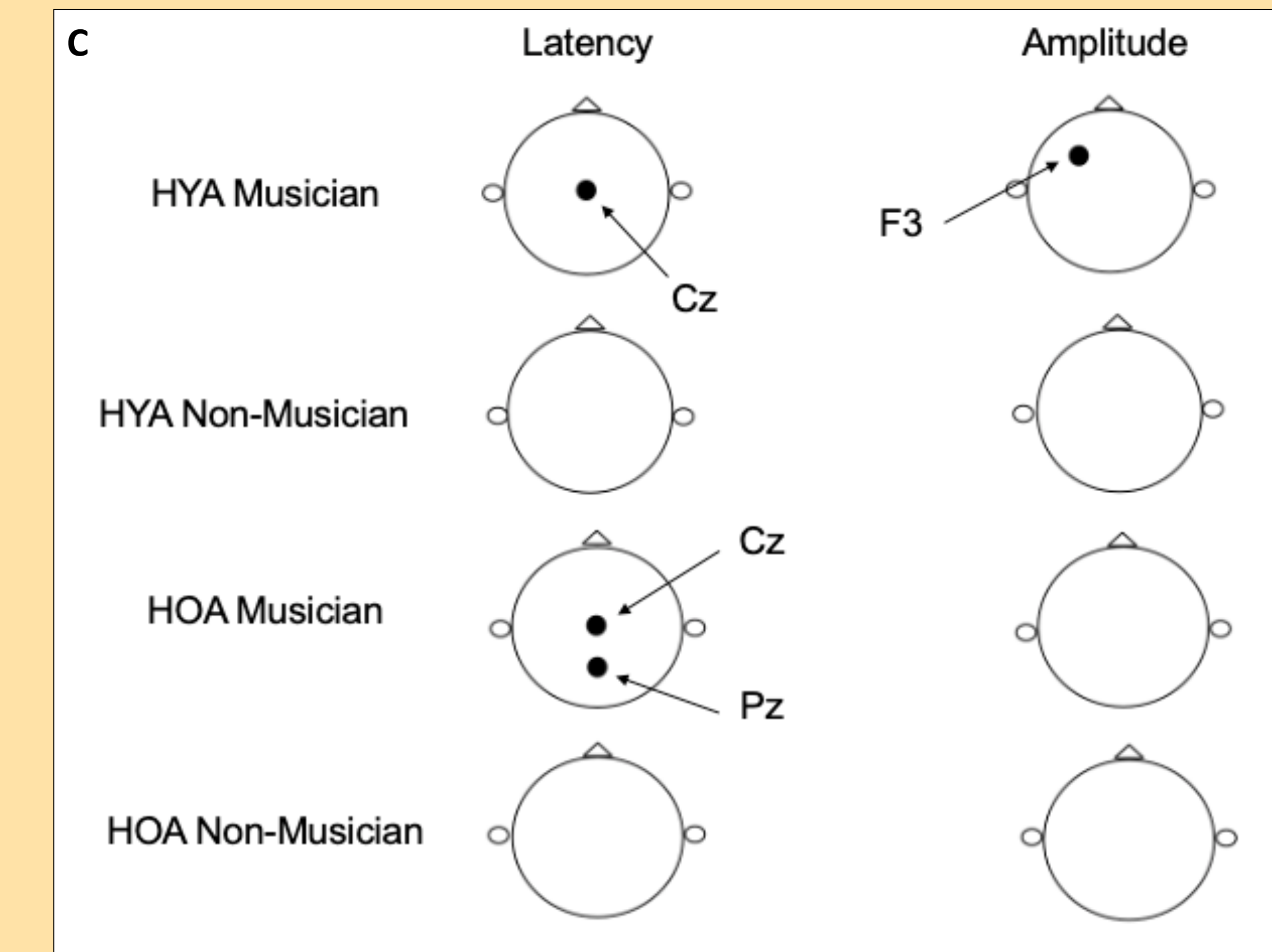
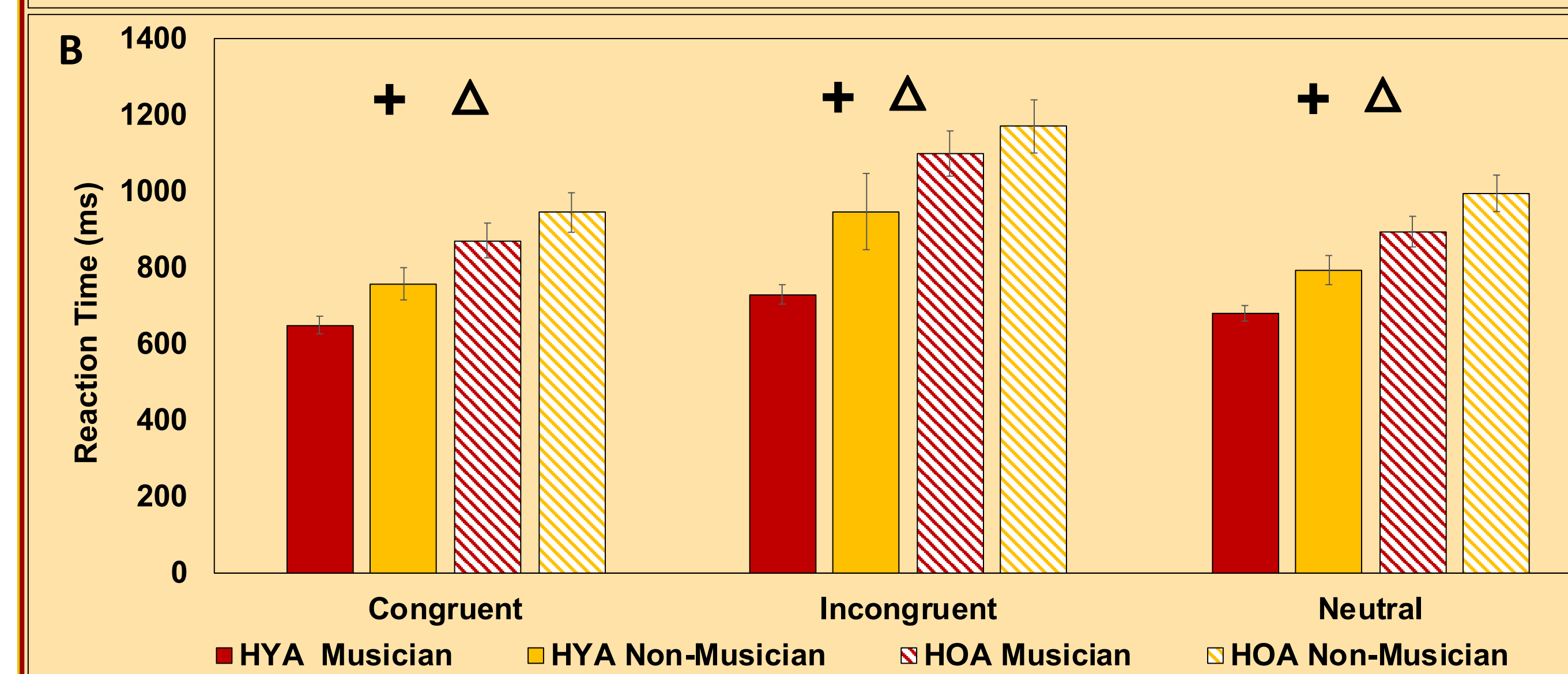
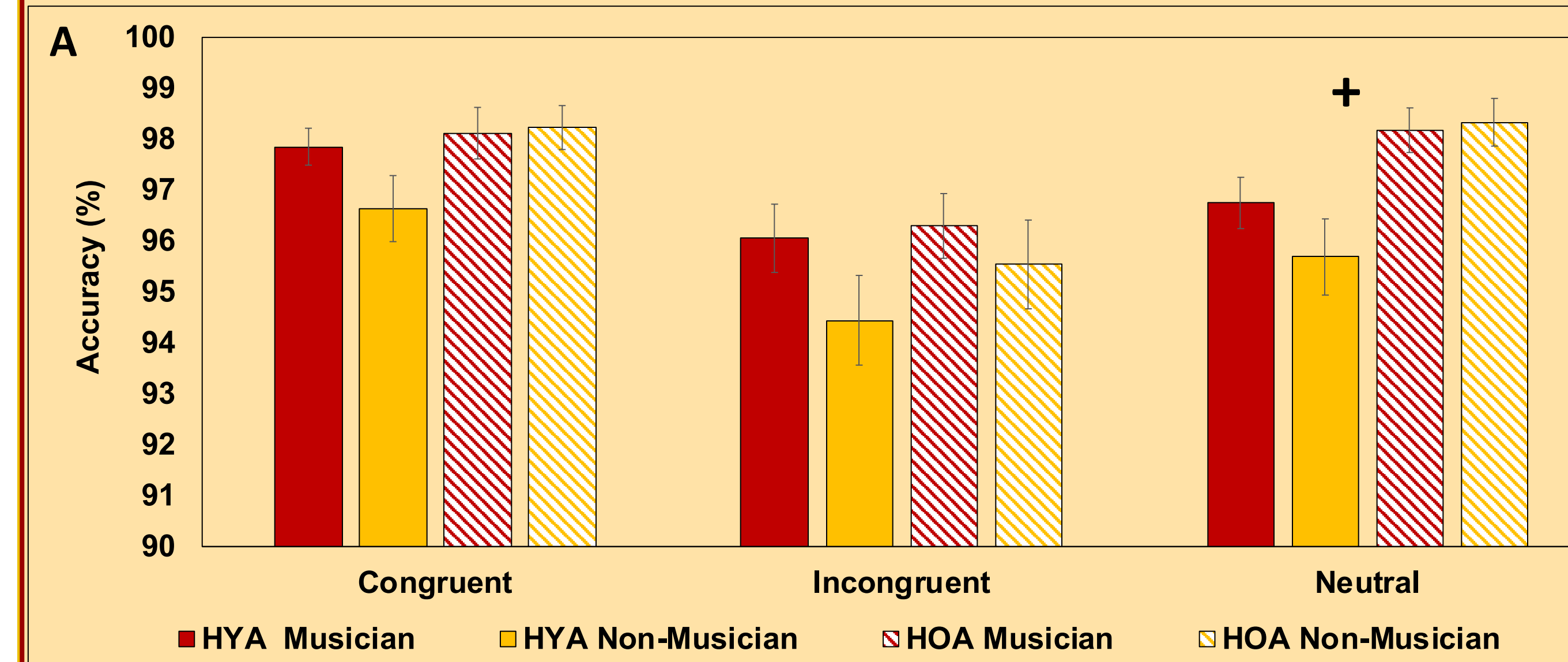


Figure 5: A. Stroop results for accuracy (%) for each condition; + = main effect of age  $p < 0.001$ . B. Stroop results for reaction time (ms) for each condition; + = main effect of age  $p < 0.001$ ;  $\Delta$  = main effect of group  $p < 0.05$ . C. P300 EEG latency (ms) and amplitude (uV) results for each group in the incongruent condition (i.e., inhibition). Black circles indicate significantly reduced latency or increased amplitude.

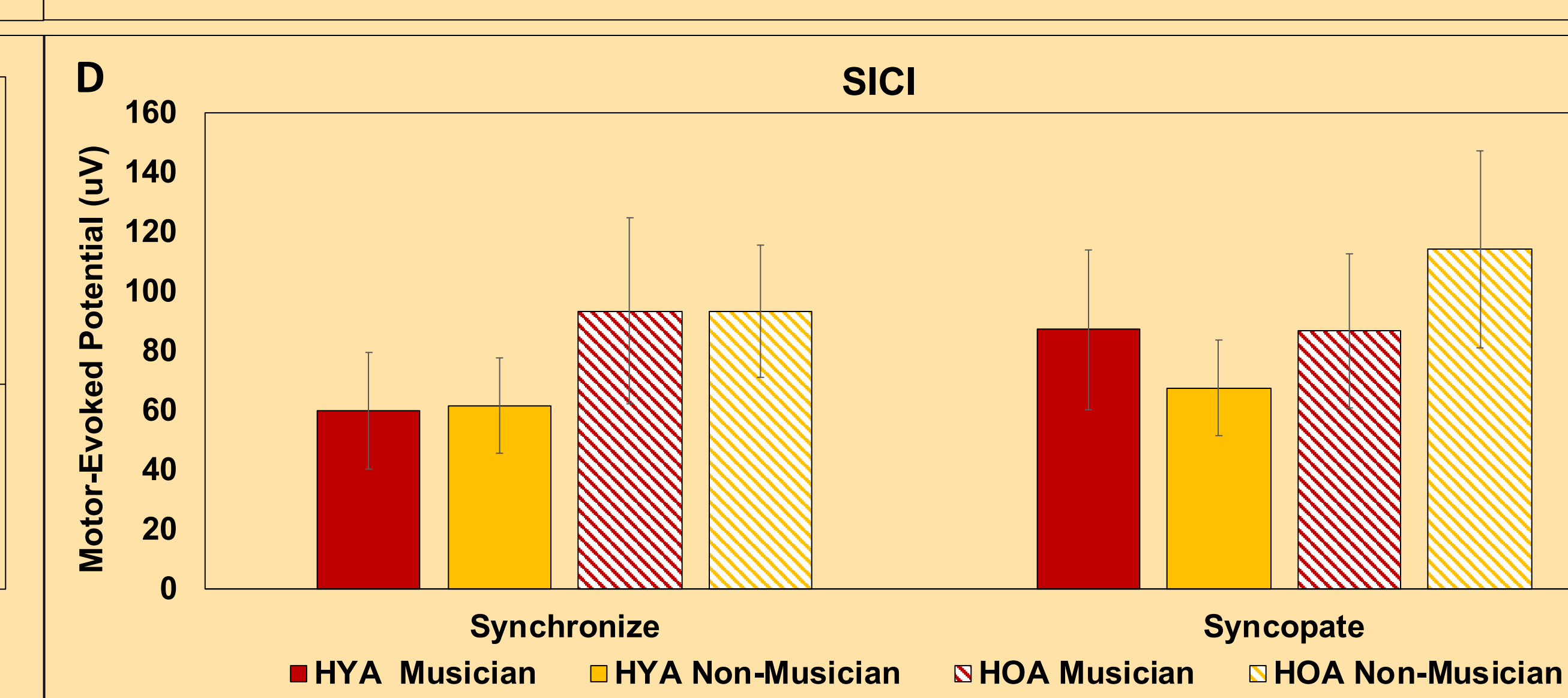
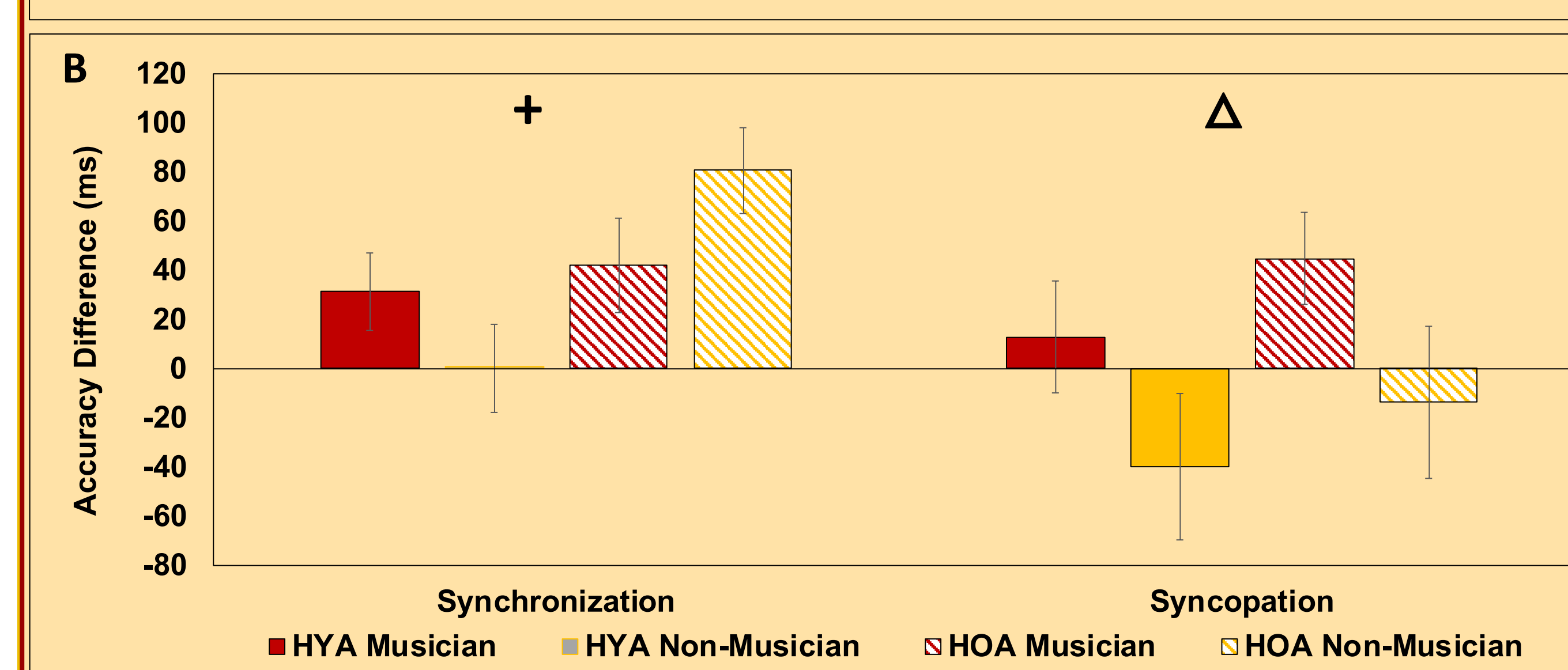
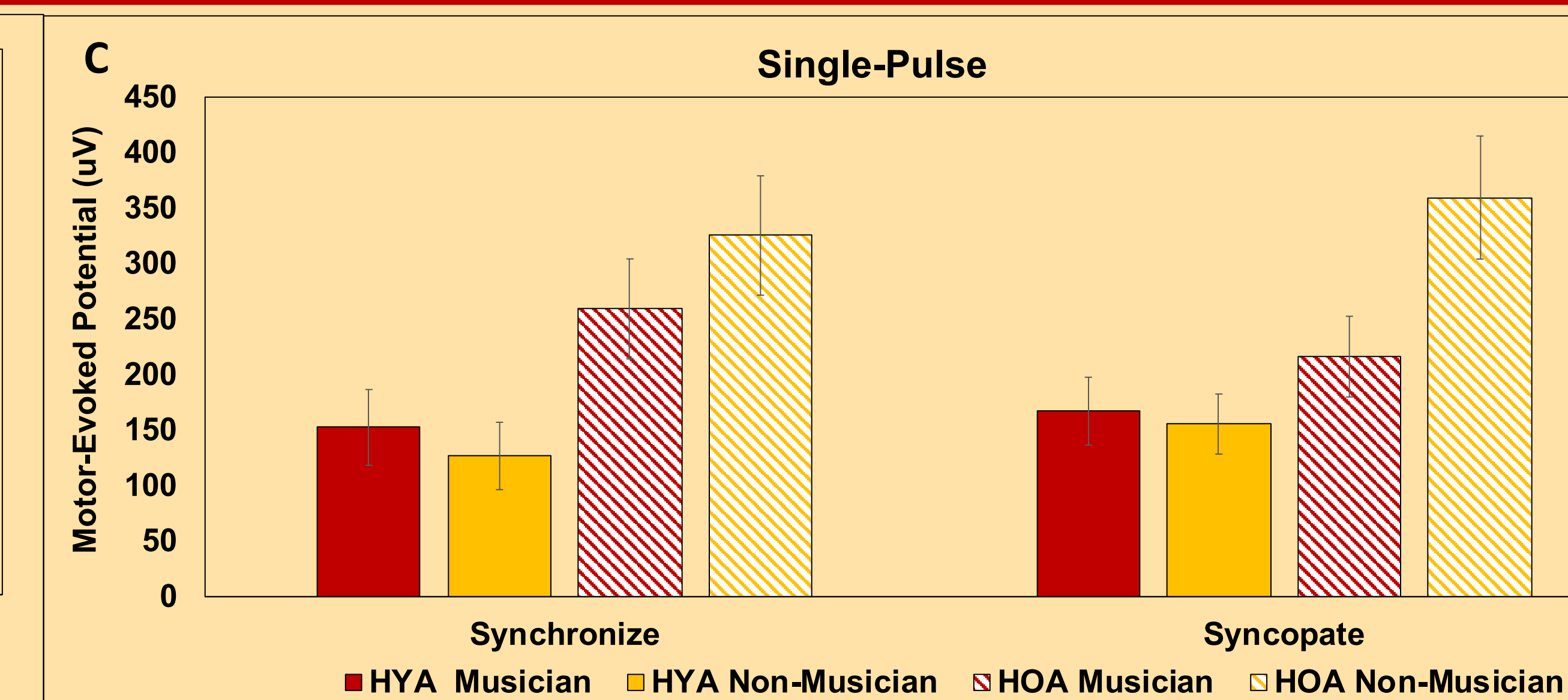
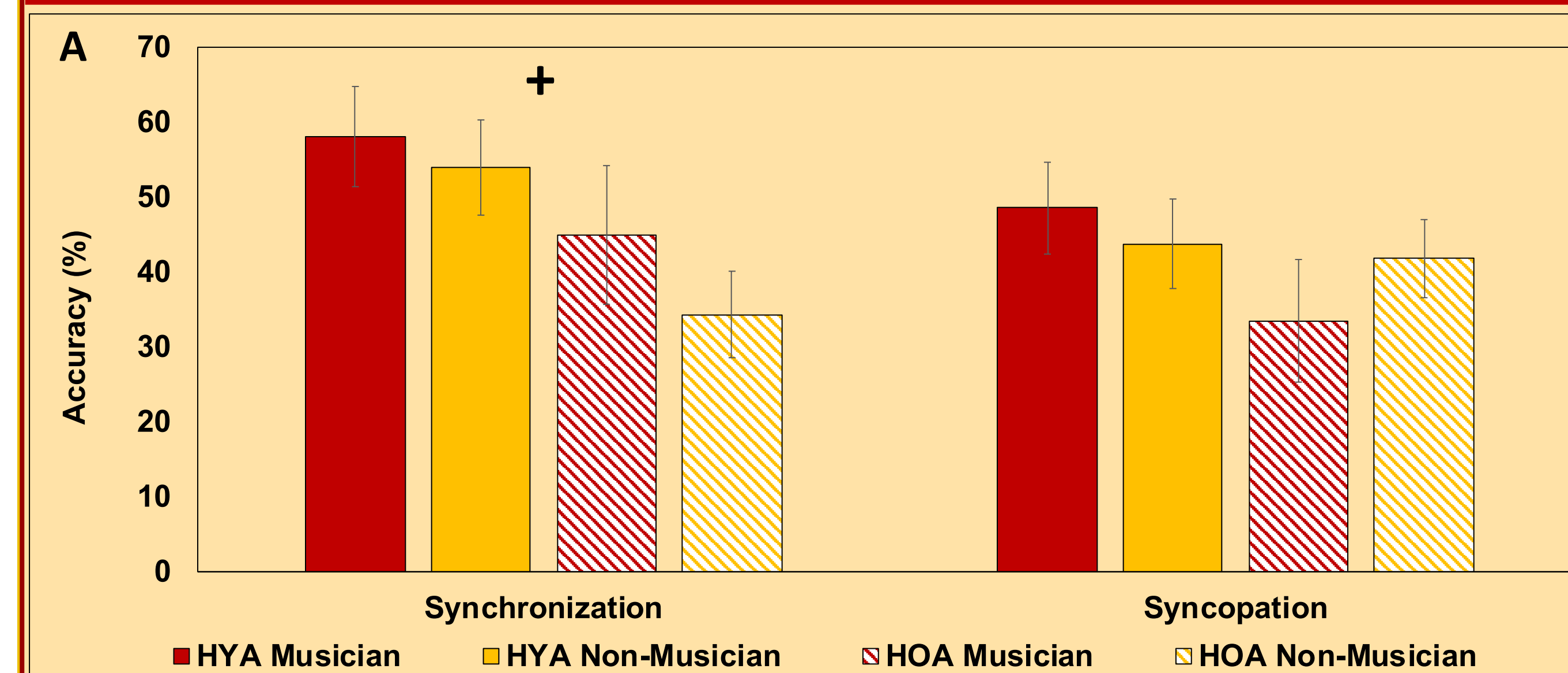


Figure 6: A. Accuracy (%) in each finger tapping condition; + = main effect of age  $p < 0.05$ . B. Accuracy difference (ms) in each finger tapping condition; + = main effect of age  $p < 0.01$ ;  $\Delta$  = main effect of group  $p < 0.02$ . C. MEP peak to peak for finger tapping single-pulse TMS. D. MEP peak to peak for finger tapping SICI TMS.

## DISCUSSION

- Musicians across the lifespan seem to display **enhanced processing speed** rather than cognitive inhibition.
  - Musicians and non-musicians across the lifespan seem to display **intact and functional** motor inhibition circuitry while at rest.
  - Music practice and increased neural motor inhibition **predict** better behavioral motor inhibition performance across the lifespan.
- Overall, clinical recommendations are that older adults should continue music practice to maintain and potentially improve brain health.  
\*This study was funded by the College of Human Sciences Graduate Scholarship (Iowa State University) and Iowa Women of Innovation Award.