



Brainwave Symphony

Can Binaural Beats boost your Focus?



Background

Binaural beats = auditory illusion created when two slightly different frequencies are presented separately to each ear.

→ Through binaural integration, the frequency difference is perceived as a rhythmic beat, which can influence neural oscillations and potentially affect cognitive states

H1: Binaural beats at 40 Hz improve concentration performance, processing speed and reduce Errors



Methods

Participants: n=20

≠ medication / mental health issues

→ two sessions, 1 day gap with randomized order

Test condition -
masking noise



Masking noise + Binaural
Beats



Concentration Task- d2
(around 15min)

I p II p d d II d

Dataanalysis

Some Participants were excluded, due to incomplete measurements or outliers, to a total of 15 statistical evaluation



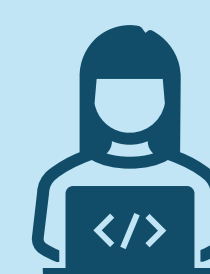
= Correct targets –
Commission errors
(false positives)



Total processed
items ÷ 220
seconds



(Commission +
Omission errors) ÷
Total processed items



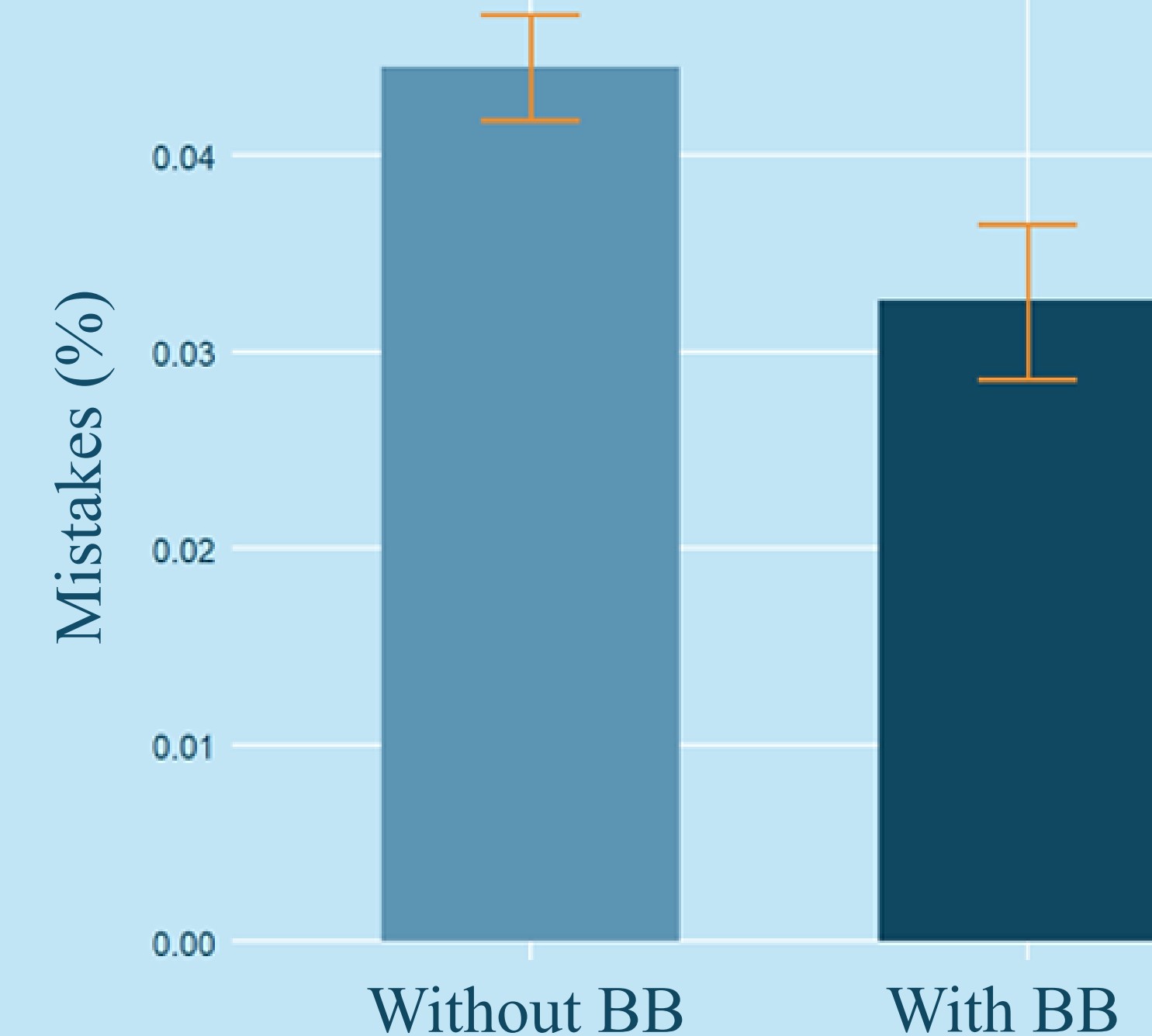
statistical analysis conducted using R
• ANOVA, Linear Regression, Levene-Test

Results

1) Significantly Fewer Errors with Binaural Beats

→ BB vs. control group ($p = .006$)

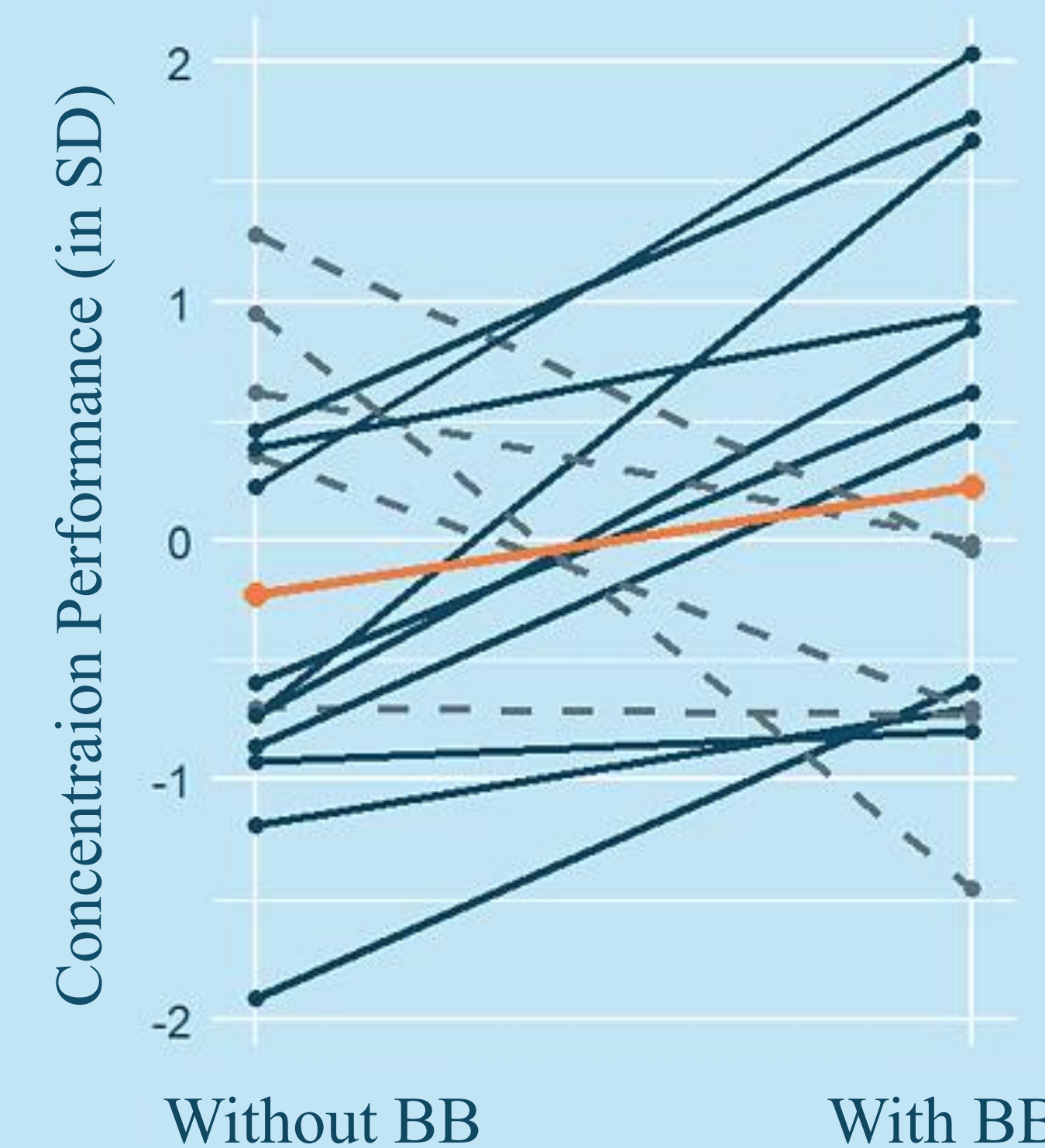
Difference in mistakes per Trial



2) No Significant Changes in average Concentration Performance

→ BB vs. control ($p = .212$).

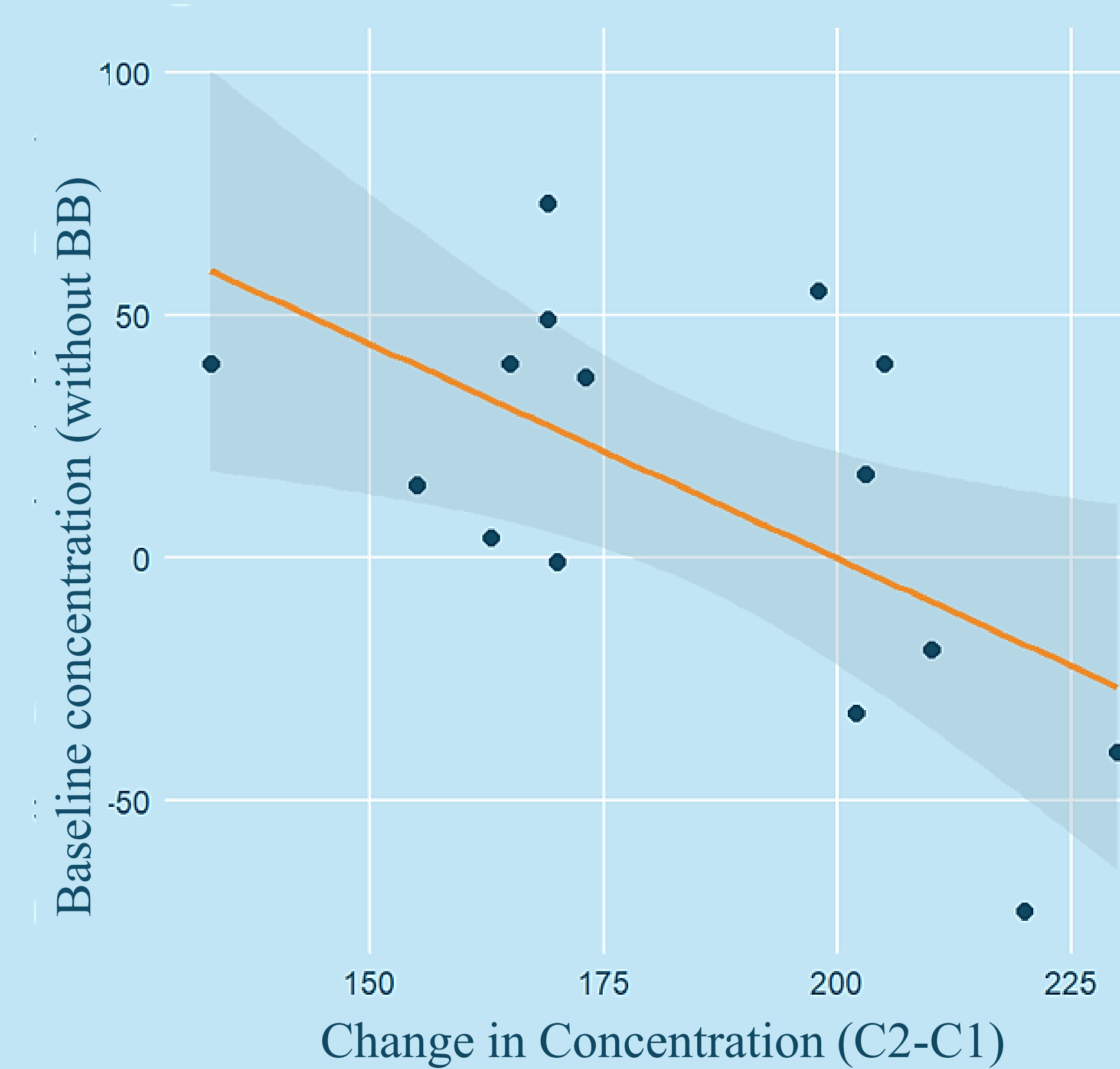
Within-subject change in concentration



3) Strong Intra-individual Effects: Performance Depends on Starting Level

→ Regression analysis → Significant negative correlation between baseline & BB gain ($b = -0.884$, $p = .019$)

Change in concentration relative to baseline

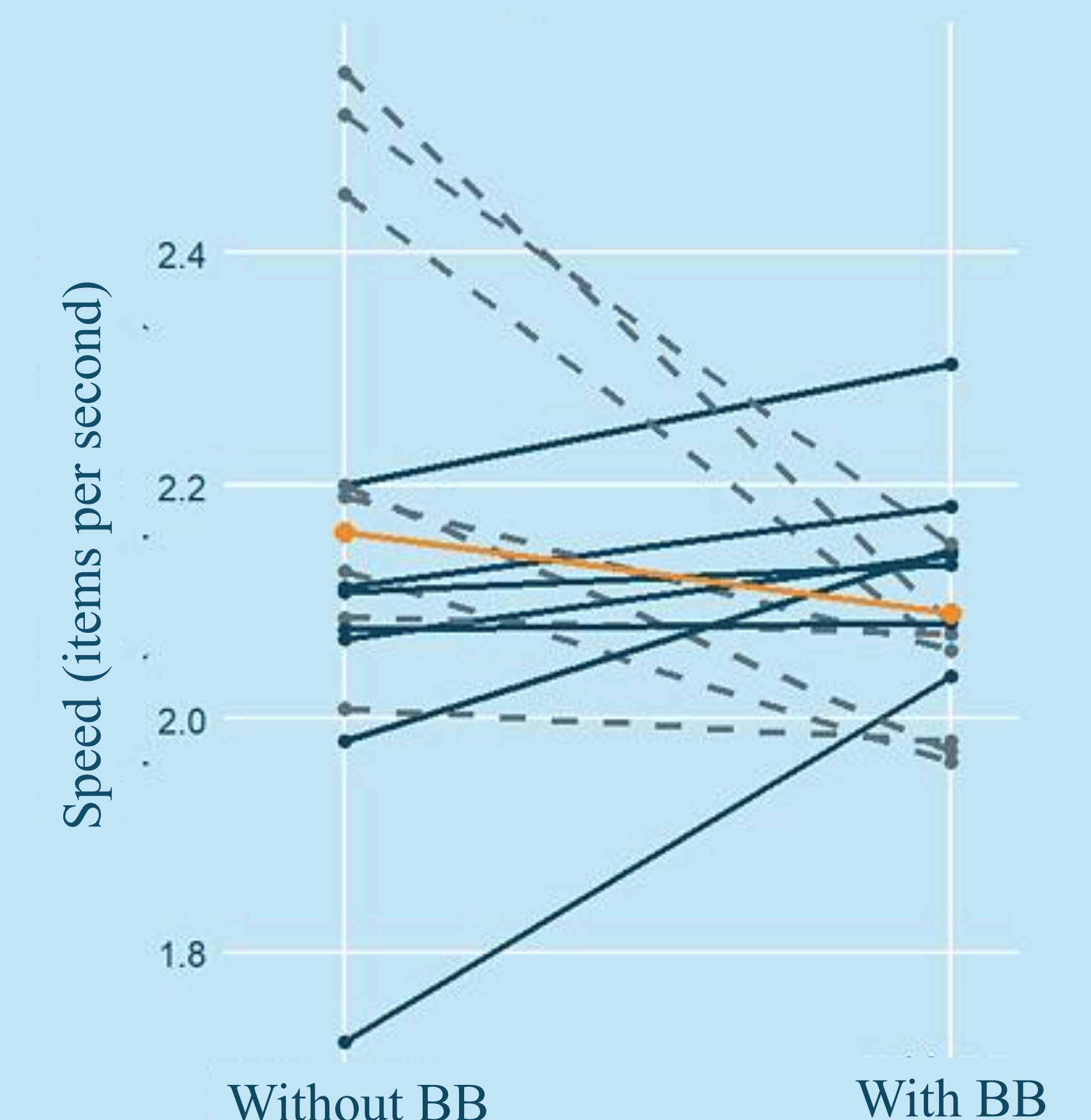


4) No Significant Changes in average Processing speed

→ BB vs. control group ($p = .242$)

→ Trend toward reduced standard deviation in speed under BB ($p = .08$)

Differences in speed in Participants



Discussion- Implications

- 1) indicates an increase in **accuracy**
- 2) likely due to **small sample size**, and **intra-individual** effects may have been **canceled out** in the average
- 3) Low Performers improved, high performers showed no or negative effects → Suggests **baseline level may moderate** BB effects
- 4) likely due to small sample size, Trend could indicate a **synchronization** of rhythmic cognitive processes



➤ **Future Studies should:** deepen the understanding of brainwave mechanism, Replicate with larger samples, and Investigate differential effects of BB (like on baseline attention, arousal, dopamine...)