HIIT The Road Jack: The Effects of Exercise on Piano Learning

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BACKGROUND

- Physical exercise, especially high-intensity interval training (HIIT), promotes motor learning[1,2]
- HIIT causes the release of neurotransmitters that enhance neuroplasticity, therefore motor learning is enhanced when exercise occurs during motor consolidation[3]

- The effects of HIIT on implicit motor learning have been examined[4], however the effects of HIIT on explicit motor learning are unknown
- Learning a piano melody involves explicit motor sequence learning

OBJECTIVES

To examine whether HIIT compared to low-intensity interval training (LIIT) after learning a piano melody can enhance its:
1) Consolidation as measured by performance at **Retention** and
2) Transfer to a novel piano melody

METHODS

Screening

- ***Inclusion criteria*:** Right-handed, age 18-35, exercise ≥1x per week
- ***Exclusion criteria***: Health conditions or medications that impact motor learning or safely performing HIIT, ≥ 4 years musical experience or current musician status, extensive video gaming experience

Study Design

Session 1
Graded Maximal Exercise Test

Start:
Males = 100 Watts (W)
Females = 50 W
+30 W/2-min W_{max}

Measures:
perceived exertion, fitness (VO_{2Peak}), heart rate

> 24 hours

Session 2
Piano Acquisition

Interval Exercise
High Intensity | Low Intensity
1hr Retention

Session 3
24hr Retention

Session 4
7day Retention

Transfer
Acquisition of New Melody

Piano Learning Dependent Variables

Pitch Accuracy
Number of correctly performed **notes**
Max(Sequence length OR Number of performed notes)

Rhythm Accuracy
Number of correctly performed **inter-onset intervals**
Max(Sequence length OR Number of performed notes)

RESULTS

Participants

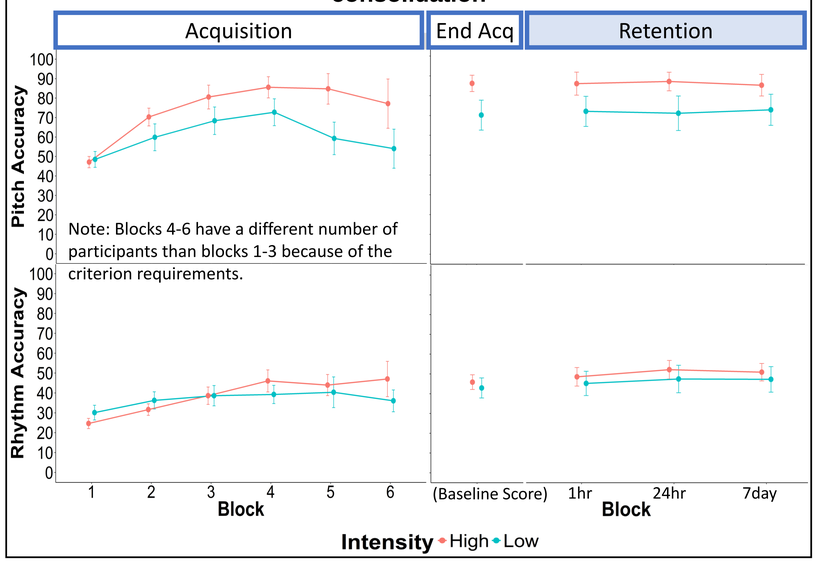
- N = 25 (F: 15, M: 10)
- 5 participants were unable to complete the high-intensity interval training; however, they are included in this intention to treat analysis

Analysis: *Nonparametric Linear Mixed Effects Modelling*

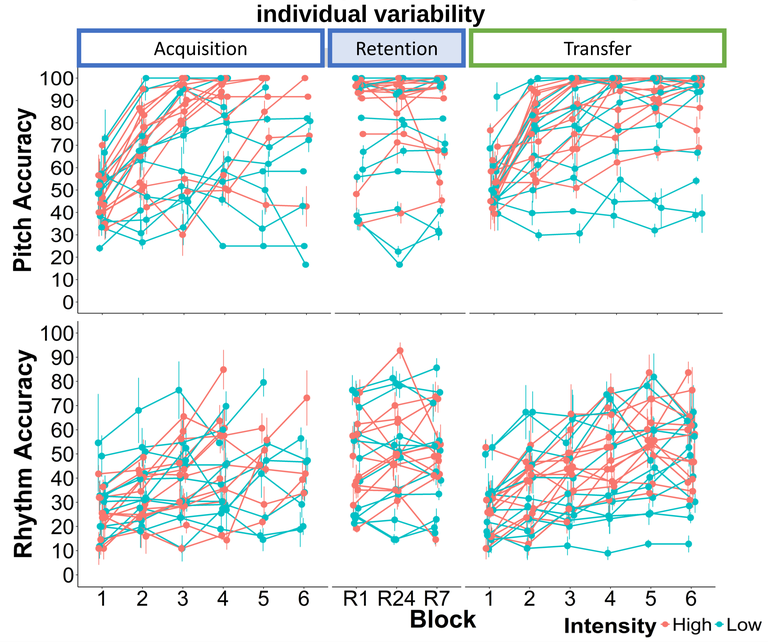
- Separate models were fitted for pitch and rhythm accuracy in acquisition, end of acquisition and retention, and transfer, with a fixed effect of intensity and a random intercept of subject

Objective 1: Retention

There was no effect of exercise intensity on sequence-specific motor consolidation

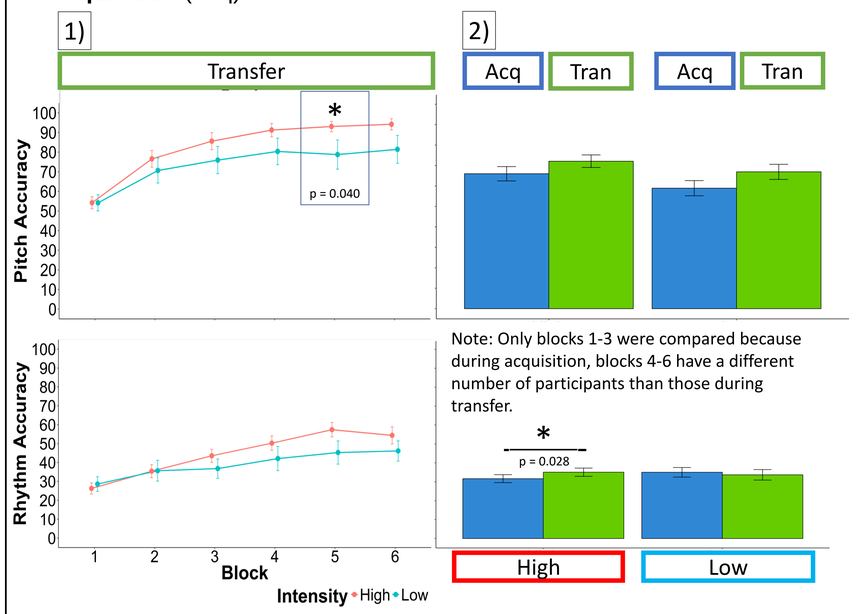


Individual data used for analysis demonstrates the large inter-individual variability

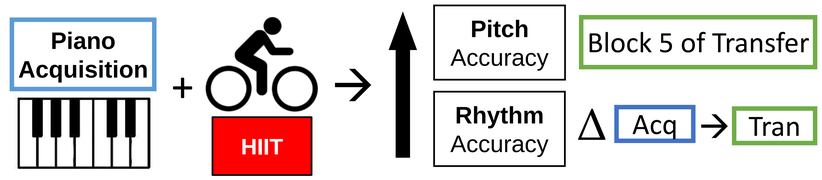


Objective 2: Transfer

The HIIT group performed with **1) better pitch accuracy that the LIIT group in block 5 of transfer** and **2) better rhythm accuracy in transfer** (Tran) **than in acquisition** (Acq)



Results Summary



CONCLUSION

- No evidence for an effect of exercise intensity on sequence-specific motor consolidation observed at 1hr, 24hr, and 7day retention
- HIIT group performed with better **rhythm accuracy** in transfer than in acquisition
- HIIT group performed with better **pitch accuracy** in block 5 of transfer than LIIT group
- **HIIT after explicit motor sequence acquisition may promote task-general, as opposed to sequence-specific, motor consolidation**

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