**AIM:** To evaluate the effects of inspiratory muscle training (IMT) on oxygen saturation (SaO$_2$), rating of perceived exertion (RPE) and rating of breathlessness (RB) during exercise in normobaric hypoxia (NH) and then an 11-day trek to 5300 m.

**Introduction**

Increasing ascent during high-altitude expeditions is typically associated with a significant 16% decrease in SaO$_2$ and inspiratory muscle strength (MIP) which can exacerbate breathlessness (1). Weaker inspiratory muscles are associated with greater inspiratory muscle fatigue (2) which exacerbates physiological and perceived stress during exercise (3). IMT has been shown to attenuate the fall in MIP with ascent to 5050 m altitude and reduce breathlessness associated with daily activities (4). Resting SaO$_2$ between 4800 and 5550 m altitude was 6% higher following IMT compared to placebo, but RB at rest was not different between groups (5). Increased SaO$_2$ during high-altitude expeditions following IMT may attenuate physiological and perceptual stress during exercise.

**Methods**

Participants: 3 M, 6 F (age 34.8 ± 10.0 years)

Exercise Protocol: Bassey's self-paced walking test was completed three times (slow, normal and fast) in normoxia (NORM) and twice in normobaric hypoxia [NH1 (PIO$_2$ = 104.1 mmHg, 3440 m altitude) and NH2 (PIO$_2$ = 85.9 mmHg, 4930 m altitude]. RPE, RB and SaO$_2$ interpolated to 4.8 km h$^{-1}$.

Matched on baseline MIP, randomised to IMT (n=4) or placebo (P, n=5)

Repeat exercise protocol

Seven weeks, twice daily
IMT: 30 efforts @ 50% MP
P: 60 efforts @ 15% MIP

**Findings**

<table>
<thead>
<tr>
<th>MIP</th>
<th>No training effects in NORM</th>
<th>No change in MIP at 3440 m</th>
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<tbody>
<tr>
<td>P</td>
<td>3.52 ± 9.84%</td>
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<tr>
<td>IMT</td>
<td>5.56 ± 8.34%</td>
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Not different between groups (P=0.887)

Completion of training
P: 68.1 ± 16.7%
IMT: 79.8 ± 13.5% (NS)

Exercise RB, SaO$_2$ and RPE in NH1 and HH (3400 m)

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<th>RB: IMT (n=3): ↓ from NH1 pre-training to HH of 0.30 ± 0.60 RB units</th>
<th>P: ↑ from NH1 pre-training to HH of 0.70 ± 1.50 RB units</th>
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<tr>
<td>RPE: IMT (n=3): ↓ from NH1 pre-training to HH of 0.67 ± 0.58 RPE units</td>
<td>P: ↑ from NH1 pre-training to HH of 2.60 ± 2.41 RPE units</td>
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SaO$_2$:
No change across NH1 trials and HH for either group

**Conclusions**

IMT may attenuate the expected decrease in resting SaO$_2$ with ascent to altitude above 4900 m similarly to previous research. Large variability and small sample sizes, along with sub-optimal completion of IMT may have negated the training response. Further research should evaluate effects of IMT on exercise SaO$_2$ and other responses during trekking expeditions above 4900 m altitude. Supervised IMT may enhance the training response.

**References**