Kinetic Changes in Therapeutical Cycling due to Posture, Cadence, and Resistance

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Introduction

- Physical therapy may stimulate cardiovascular and muscular responses while minimizing joint loads and impacts
- Rehabilitation and therapy regimes frequently incorporate cycling due to small joint loads and mechanical impacts
- Posture and pedaling strategy (e.g., resistance, cadence) may affect cycling mechanics and forces
- **Purpose**: to investigate the effects of posture and pedaling strategy on kinetics at the pedals, saddle, and handlebar.

Methods

Sample characteristics: physically active, injury-free, male participants (n=10).

	Mean ± SD
Age [years]	26.0 ± 7.0
Body height [m]	1.70 ± 0.05
Body mass [kg]	70.0 ± 10.6

Cycling test: each participant performed 15 consecutive stable cycles per trial, applying 6 different pedaling strategies in each of 3 different postures (randomized order of trials).

3 postures
(Bini et al., 2011)

- Neutral
- Comfort
- Athletic

6 pedaling strategies

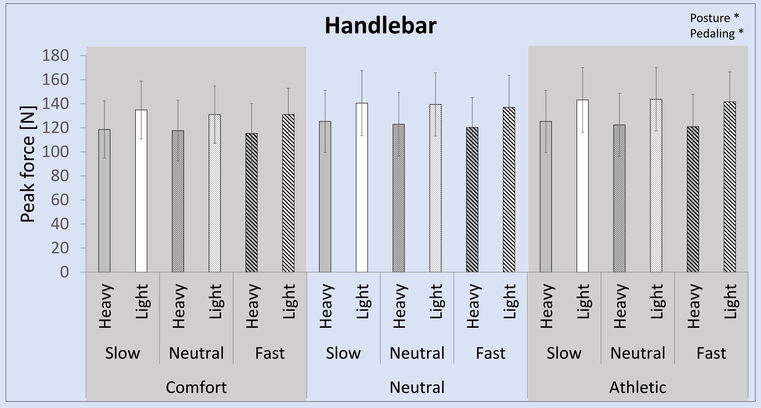
Cadence	Resistance
Neutral#	Light
Neutral#	Heavy
Slow$	Light
Slow$	Heavy
Fast§	Light
Fast§	Heavy

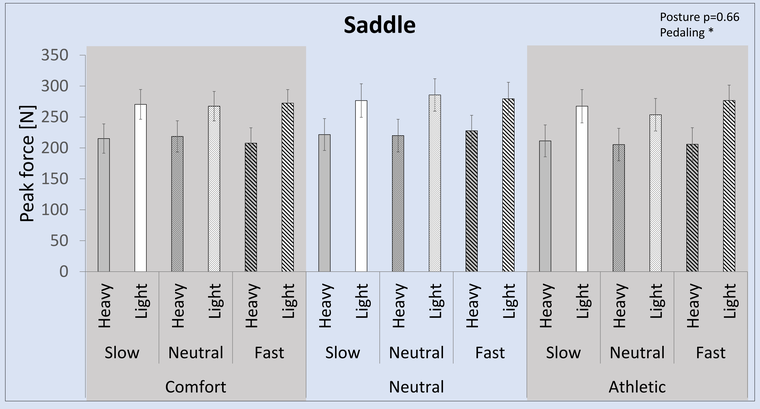
# self-selected
$ self-selected –10 rpm
§ self-selected +10 rpm

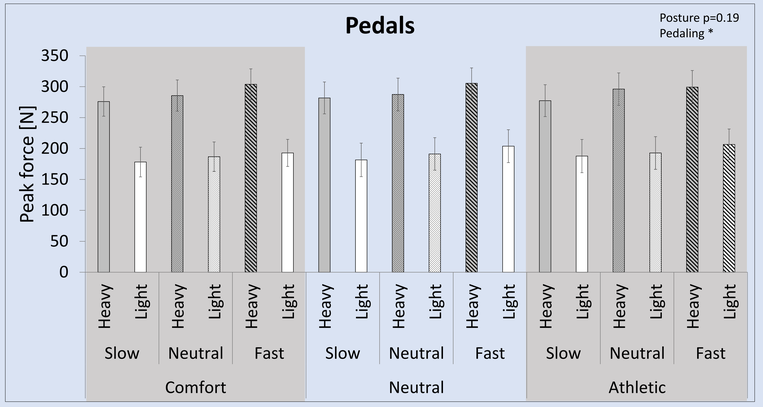
Equipment:

Dynamic Cycling Fit system
(Giant Manufacturing Co., Taiwan)
with 5 strain gauge-based force sensors (50 Hz)

Results







Discussion

- **Consistent patterns** across all sensor locations (i.e., handlebar, saddle, pedals), allowing for generalizations
- **No effects of posture** (except for reduced forces at the handlebar in comfort posture)
- Forces **affected by resistance** but not by cadence
- **Higher resistance → smaller forces** at saddle and handlebar (opposite in pedals)
- **Application** must be tailored for individual needs

Conclusions

- **Posture** may be selected **based on individual preference** (less influential in clinical context than pedaling strategy)
- **Pedaling strategy** may be a **recommend focus** for clinicians
- **Adjusting resistance and cadence** to achieve desired training outcomes and account for individual needs