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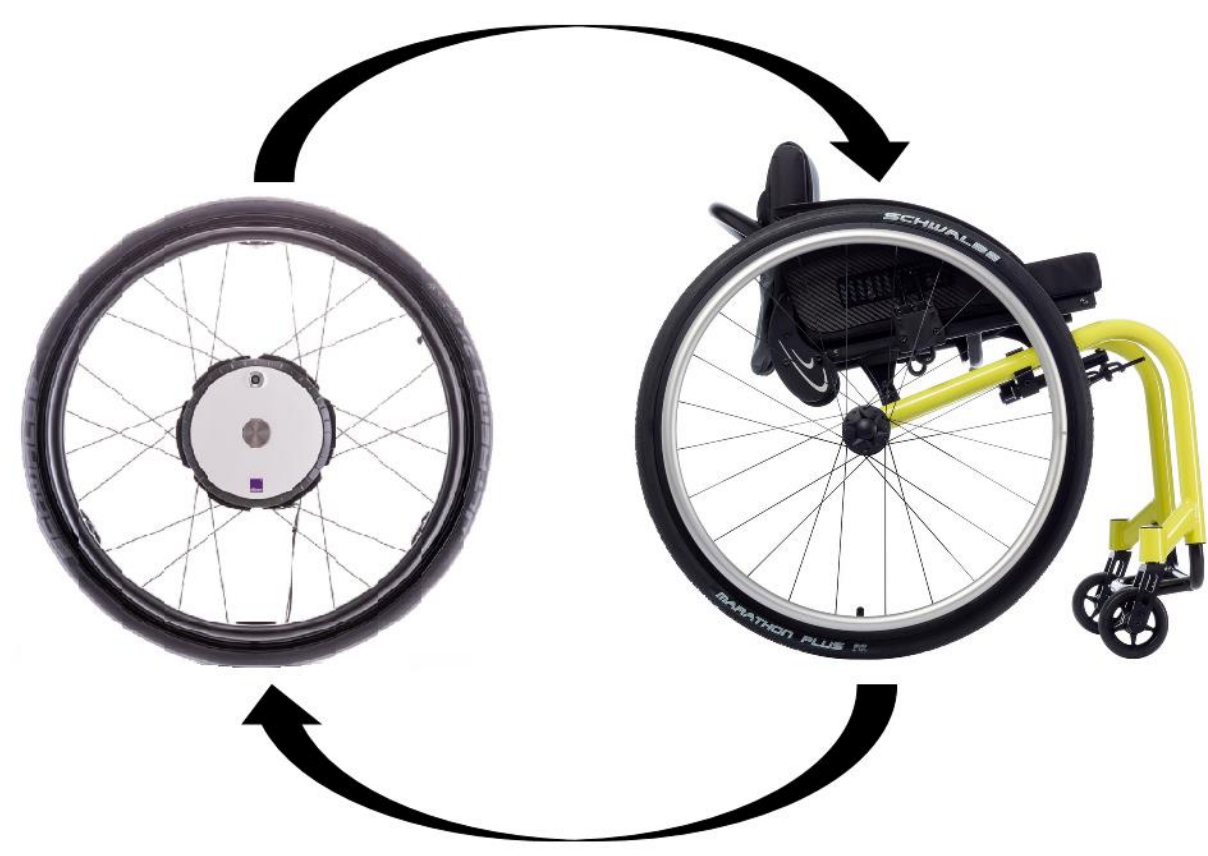
Practice-based skill acquisition of pushrim-activated power-assisted wheelchair propulsion versus regular handrim propulsion in novices

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Background

Regular handrim wheelchair (RHW) propulsion is straining for the upper extremities and wheelchair users often experience overuse problems. A recent advancement in wheelchair technology that could assist users is the pushrim-activated power-assisted wheelchair (PAPAW). PAPAWs are challenging to control, yet it is unclear how people learn to use a PAPAW. The purpose of this study was to examine early skill acquisition through practice in PAPAWs and compare it with RHWs.



Hypotheses:

It was hypothesized that mechanical efficiency and control improves over time in both propulsion modes. It was also hypothesized that RHWs are easier to control but are more physiologically demanding. Moreover, a positive transfer of skill was expected between the two modes

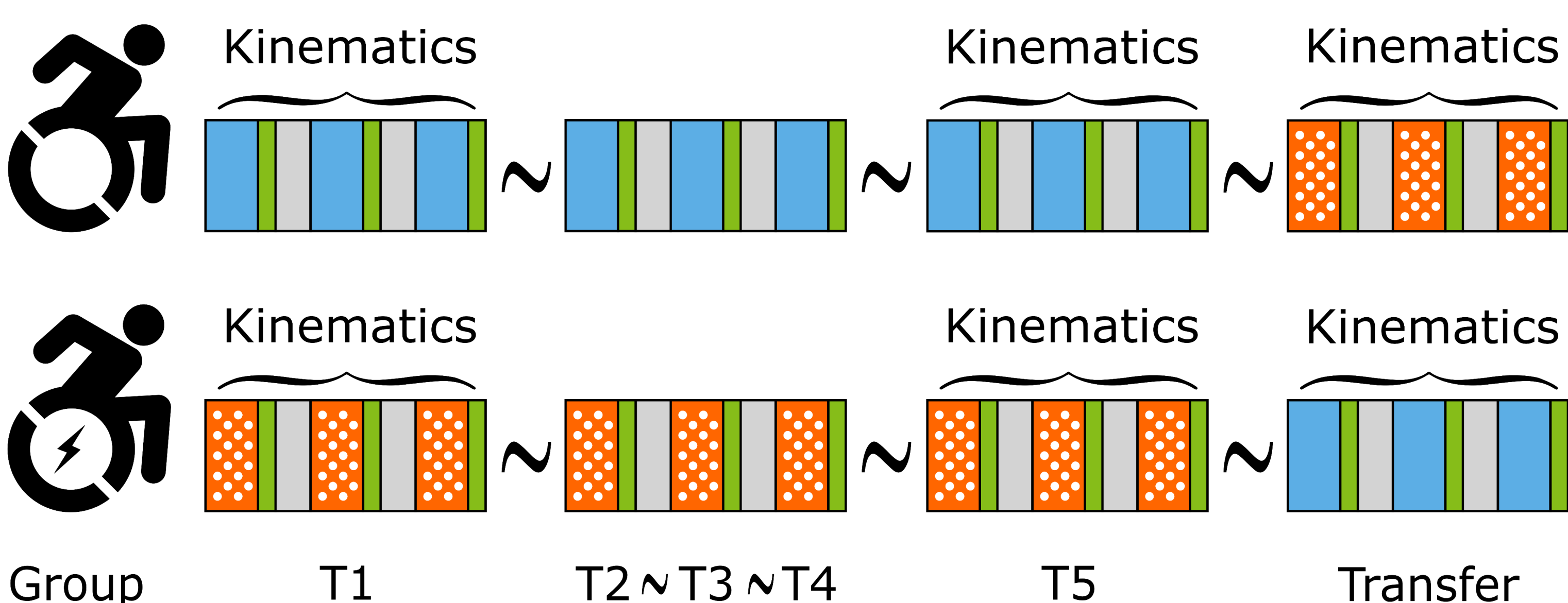
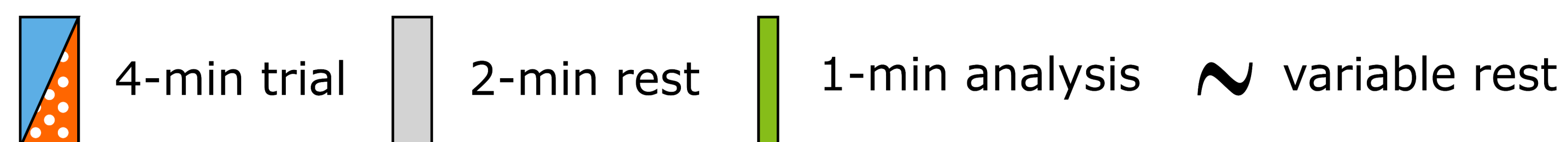
Methods

Participants: Twenty-four able-bodied novices were randomly allocated to either the RHW group or the PAPAW group.

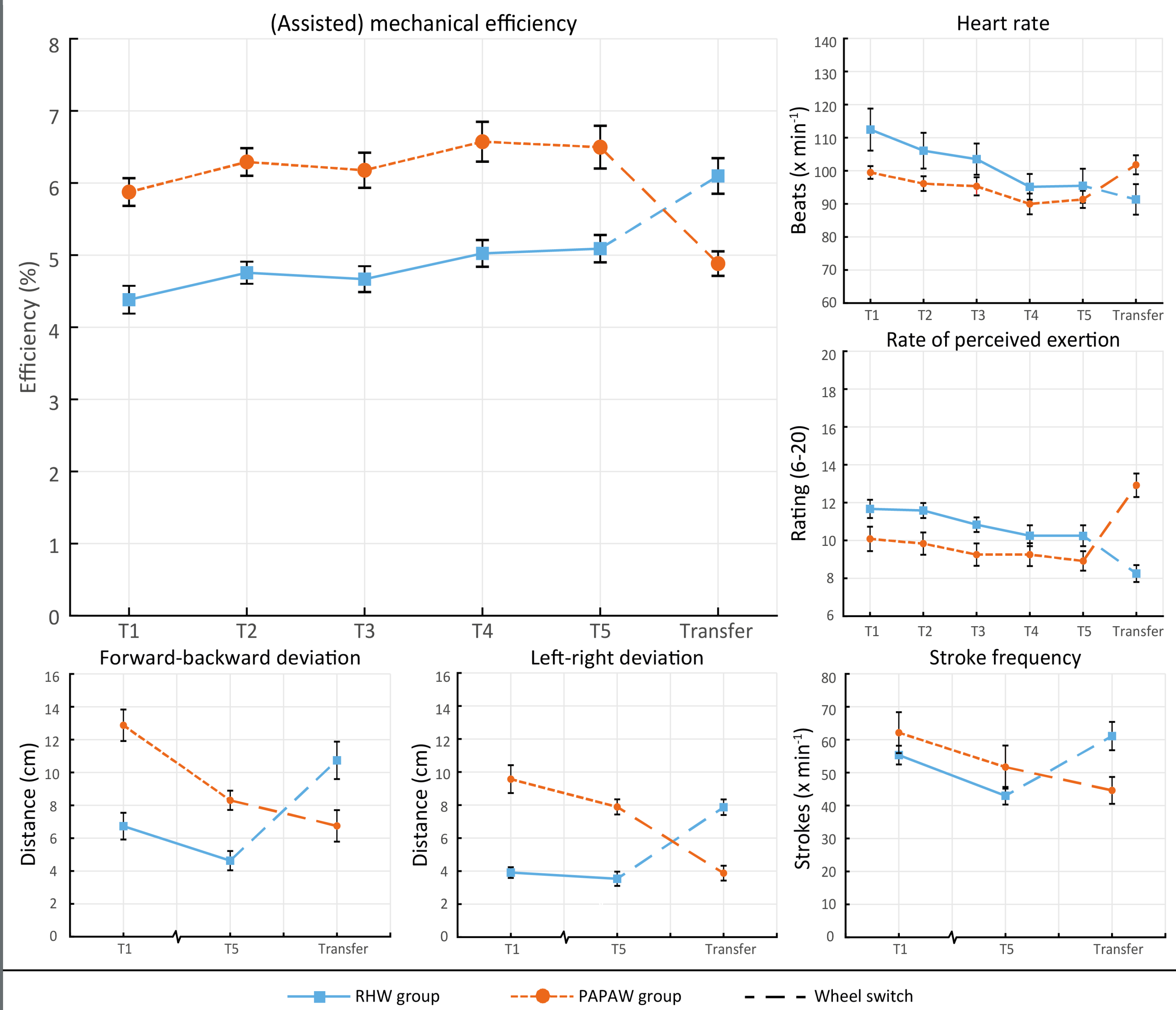
Tests: The experiment consisted of five sessions with three blocks of 4 min steady-state practice at 1.11 m/s and 0.21 W/kg. Finally, a transfer to the other mode was made.

Instrumentation: Data were collected with a drag-test, breath-by-breath spirometry, and a motion capture system.

Analysis: The last minute of each four-minute block was used for analysis. A mixed analysis of variance (ANOVA) was used to test for group, time, and interaction effects.



Results



Both groups improved their (assisted) mechanical efficiency, reduced their stroke rate, right-left and forward-backward deviation on the treadmill, and had a lower rate of perceived exertion (RPE) over time.

(Assisted) mechanical efficiency was higher for the PAPAW group than for the RHW group and RPE was lower. However, left-right and forward-backward deviation was also found to be higher in the PAPAW group.

Participants performed better in their transfer session than the opposing group during their first session, but this finding did not reach statistical significance.

Conclusions

At the group level the energetic cost of RHW and PAPAW propulsion can be lowered through low-intensity practice in novice users.

The PAPAW is more 'efficient' than the RHW given the reduced energy requirement of the user from the motor assist, but more difficult to control.

Future studies on PAPAWs should focus on the control needs of the user and their interaction with the power-assist technology.

