

Additional information

Dataset of the front-wheel load of a set of wheelchair propulsion experiments

Table 1.

Overview of the abbreviations and calculation method of all predictor features and outcome feature that were used in the predictive model.

	<i>Predictor feature</i>	<i>Determined by</i>
v_{wc}	Wheelchair velocity in m/s	(Gyroscope signal of IMU around wheel axis \cdot rear wheel diameter $\cdot \pi$) / 360
a_{wc}	Wheelchair acceleration in m/s ²	Derivative of v_{wc}
φ_{tr}	Trunk inclination angle in rad	Based on extended Madgwick filter (van Dijk et al. 2021) with β -value being 0.0015 (if wheelchair acceleration < 0.1 m/s ² for at least 5 consecutive samples) or 0.9635 (otherwise)
$\dot{\varphi}_{tr}$	Angular velocity of trunk (around sagittal axis) in rad/s	Gyroscope signal (around sagittal axis) of trunk-mounted IMU
$\ddot{\varphi}_{tr}$	Angular acceleration of trunk (around sagittal axis) in rad/s ²	Derivative of $\dot{\varphi}_{tr}$
$a_{tr,\perp}$	Trunk acceleration perpendicular to the frontal plane of the trunk in m/s ²	Acceleration signal (directed perpendicular to frontal plane) of trunk-mounted IMU
$a_{tr,\parallel}$	Trunk caudal-cranial acceleration in m/s ²	Acceleration signal (in caudal-cranial direction) of trunk-mounted IMU
$ a_{tr} $	Magnitude of trunk acceleration vector in m/s ²	Euclidean norm of the 3D acceleration signal of trunk mounted IMU (subtracted by 9.81)
	<i>Outcome feature</i>	<i>Determined by</i>
$\hat{F}_{N,f}$	normalized relative front wheel-load in %	Force data from the front wheels' load pins, calculated as $F_{N,f} / F_{N,tot} \cdot 100\%$

Table 2.

Wheelchair dimensions and tyre characteristics of the RGK Chrome all-courts wheelchair that was used for all measurements. The rear wheels had pneumatic tyres. The front wheels were solid rubber castor wheels.

Mass	13.5 kg
Wheel radius (rear)	0.61 m
Wheel radius (front)	0.075 m
Camber angle (rear)	13 degrees
Seat position	0.08 m
Distance front-rear wheels	0.39 m
Rolling resistance coefficient (rear – 5.25 bar)	.0104 – .0089
Rolling resistance coefficient (rear – 3.50 bar)	.0112 – .0100
Rolling resistance coefficient (rear – 1.75 bar)	.0139 – .0123
Rolling resistance coefficient (front)	.0147

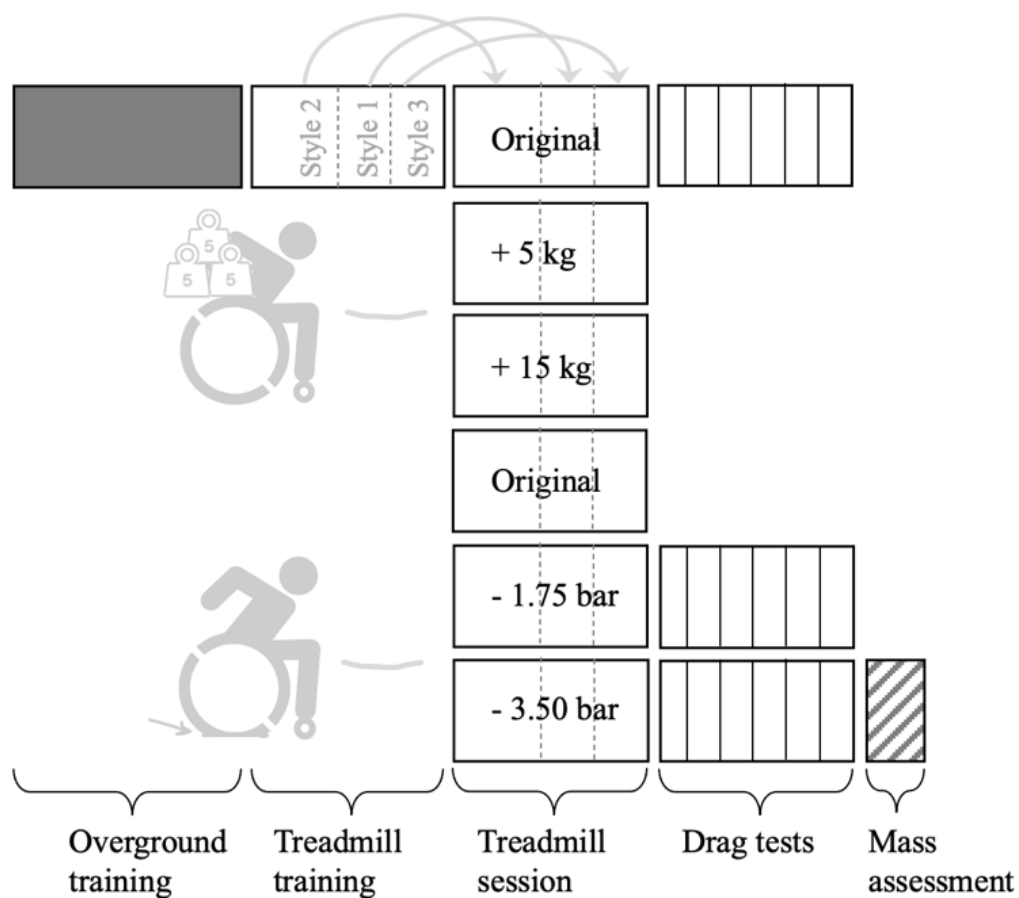


Figure 1. Schematic overview of measurements during different sessions. The ‘original’ treadmill session refers to the condition with no added mass (0 kg) and fully inflated rear wheel tyres (5.25 bar). Mass was assessed on a 1.0 x 1.0 m force plate.

¹van Dijk, Marit P., Manon Kok, Monique A. M. Berger, Marco J. M. Hoozemans, and DirkJan H. E. J. Veeger. 2021. “Machine Learning to Improve Orientation Estimation in Sports Situations Challenging for Inertial Sensor Use.” *Frontiers in Sports and Active Living* 3:670263. doi: 10.3389/fspor.2021.670263.