Appendix: Biomechanical parameters definition

Spatio-temporal parameters

Stroke: propulsion cycle.

Push phase: phase of a propulsion cycle during which the hand pushes on the handrim to propel the manual wheelchair.

Recovery phase: phase of a propulsion cycle during which the hand is not in contact with the handrim.

Contact angle: angle distance travelled by the hand on the handrim during the push phase.

Push time: duration of a push phase.

Recovery time: duration of a recovery phase.

Cycle time: duration of a propulsion cycle.

Cycle frequency: inverse of average cycle time.

Speed: average speed of the manual wheelchair or average simulated speed of the manual wheelchair (on a roller ergometer or treadmill).

Kinematics

Joint angle: angle between two skeletal segments.

Kinetics

Rate of rise: represents the initial impact load on the pushrim. It has multiple definitions:

- Maximum value of the derivative of the resultant force with respect to time during the first third of the stroke (as defined in Koontz et al., 2005): $RoR = \max_{0 \le t \le \frac{T}{3}} \frac{dF_r}{dt}$, *where RoR*

is the Rate of Rise, t time, T the duration of the stroke, and F_r the resultant force applied to the handrim.

- Peak of the resultant force divided by the time to reach it since the beginning of the stroke (present in the literature, but not in our reviewed studies): $RoR = \frac{\widehat{F_r}}{T_{peak}}$, *where RoR is the Rate of Rise, $\widehat{F_r}$ the peak of the resultant force applied at the handrim, and T_{peak} the time to reach $\widehat{F_r}$.*

Handrim forces: forces applied to the handrim by the hand.

Fraction of effective force: or mechanical effective force, represents the ratio between the forces useful to turn the rear wheel and the total force applied to the handrim. It has multiple definitions:

- Division of the square tangential force by the square resultant force (used in most of the reviewed studies): $FEF = \frac{{F_t}^2}{{F_r}^2}$, *where FEF is the Fraction of Effective Force, F_t the tangential force applied to the handrim, and F_r the resultant force applied to the handrim.*
- Propulsion moment squared divided by the handrim radius squared, all divided by the resultant force on the handrim squared: $FEF = \frac{\frac{M^2}{{r_h}^2}}{{F_r}^2}$, *where FEF is the Fraction of Effective Force, M the propulsion moment, r_h the handrim radius, and F_r the resultant force applied to the handrim.*

Net joint moment: minimum moment required at a joint to obtain the observed kinematics.

Mechanical power: product of handrim tangential forces and the manual wheelchair's speed

Mechanical work: time-integer of mechanical power