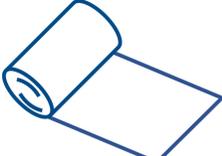


HOW DOES Rolling Resistance AFFECT MANUAL WHEELCHAIR USAGE?

Rolling resistance is the force opposing manual wheelchair propulsion due to friction and loading on the tire or caster.

Minimizing rolling resistance reduces propulsion effort and the risk of upper extremity repetitive strain injuries. Evaluation of factors reveals their respective level of influence.

Important influencers inform clinician decisions: product selection, setup & maintenance.

TIRE PRESSURE	WEIGHT	TOE IN/OUT	SURFACES	CASTER/TIRE TYPE
				
Under-inflated tires have higher rolling resistance	Rolling resistance is proportional to weight	Misalignment of the rear wheels increases rolling resistance	Different surfaces impact rolling resistance	Different casters and wheels have different rolling resistances

Increased force can be thought of as increased weight a user must carry:
PERCEIVED WEIGHT EQUIVALENTS

TIRE PRESSURE* (40% of Max)	LOW POLY SOLID TIRE*	TOE OUT* 2 degrees	CARPET* Medium Pile	AIRLESS INSERT TIRES*
 16 lbs.	 35 lbs.	 60 lbs.	 82 lbs.	 96 lbs.
				

*compared to a high pressure pneumatic tire on a hard surface with a 250 lb user and device weight.

HOW CAN I REDUCE ROLLING RESISTANCE?

Guidelines for Setup and Maintenance:

TIRE PRESSURE	WEIGHT	TOE IN/OUT	SURFACES	CASTER/TIRE TYPE
<ul style="list-style-type: none">• Monitor tire pressure weekly• Keep tires inflated• Adjust inflation when changing elevation	<ul style="list-style-type: none">• Minimize weight and accessories• Keep the majority of weight over the rear axle with a forward axle position	<ul style="list-style-type: none">• Check and correct for misalignment• Check and correct for excessive movement in wheels	<ul style="list-style-type: none">• Inform users that carpet is harder to propel across• Reduce time spent on carpet and ramps	<ul style="list-style-type: none">• Avoid use of airless inserts when possible• Choose casters and tires for the user's needs

Each influencer acts in a cumulative manner when combined. Camber and speed have little impact. This information helps to inform decision making but does not overrule clinical judgement. Standards for rolling resistance testing procedures and rear-wheel alignment do not exist.

ROLLING RESISTANCE SUMMARY

Rolling resistance should be kept as low as possible while maintaining optimal device setup.

How do I benefit from utilizing rolling resistance research, if I am a...



WHEELCHAIR USER

Wheelchair users can learn how setup and environmental factors impact your long-term health



MANUFACTURER

Manufacturers can perform testing to improve tire, wheel and caster design and performance



HEALTHCARE PROVIDER

Clinicians can learn how to setup the wheelchair to improve propulsion and reduce upper extremity pain and injuries



POLICY MAKER

Policy makers can adopt standardized testing for rolling resistance in wheelchairs