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WHEELCHAIR SELECTION MANUAL
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Overview

Set up has an incredible effect on the performance of wheelchairs. BC Rehab has published two comparison studies highlighting the relative merits of brand name chairs. These studies were well received locally and provided clinicians with valuable information to aid in their selection process.
Alas, times have changed and this type of information is no longer relevant.

Most manufacturers upper end chairs can be set up to meet the needs of most clients. Fitting a lower back, moving the rear wheels forwards and removing the armrests can make a stable chair highly manoeuverable. Replacing the tires with high pressure clinchers and substituting 3" casters and removing unnecessary accessories like the armrest brackets, wheel locks and push handles, will make the same chair a reasonable one for many wheelchair sports.

Consumers who want a new chair, may in fact already have the best chair for their particular needs. It just needs to be set up differently. Sometimes clients gain or lose weight after the chair has been fitted and feel that they need another one. It might be that the chair that they are using can be made wider to accommodate their increased bulk at little or no cost. It is possible to make width adjustments of up to 3 inches on some wheelchairs.

These are just a few examples of how set up can have an impact on the performance of a consumers wheelchair. Here are some of the interesting facts that we discovered during our research.

Skin Pressure Facts

- Each degree of recline reduces ischial pressure by 1%
- 5” seat drop increases ischial pressure by 10 - 20%

Dimensional Facts

- Each degree of camber makes the chair 1” wider
- 26” tires increase the height of lift required to clear the wheel by 1”
- 26” tires reduce the space for a sliding transfer by 1.5”

Rolling Facts

- The rolling resistance of a typical chair with 24” tires and 8” casters doubles when the centre of gravity is moved from directly over the rear wheels, to mid way between the wheels and casters.
- Dense, low pile carpet has the same effect on rolling resistance as reducing tire pressure to 10 psi.

Tire Facts

- Solid tires have 35% more rolling resistance than conventional tires on hard surfaces
- High pressure sew up tires have 30% less rolling resistance

Toeing Facts

- A 1 degree toeing error increases energy expenditure by 50%
- A 2 degree toeing error increases energy expenditure by 150%

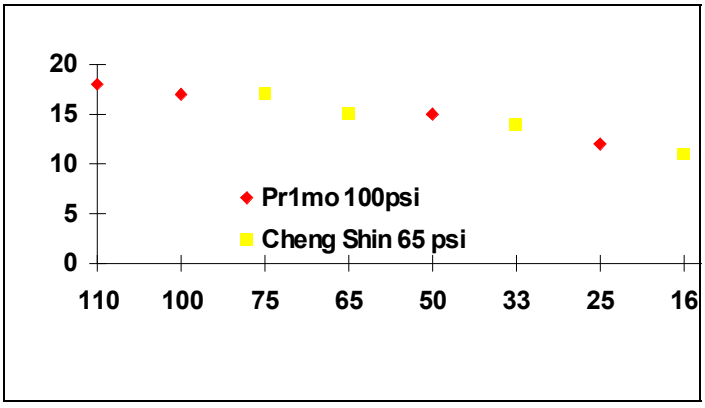
Tire Pressure Facts

- Most people don't notice air loss until pressure is down to 50%
- Tires take 7 weeks to lose 50% of their air
- Hand held pumps can realistically only manage 60 psi or so
- Gas station air lines are kept at approximately.. 150 psi.

Some of these findings were contrary to our perceptions and we conducted numerous tests to check the validity of the information that we had collected.

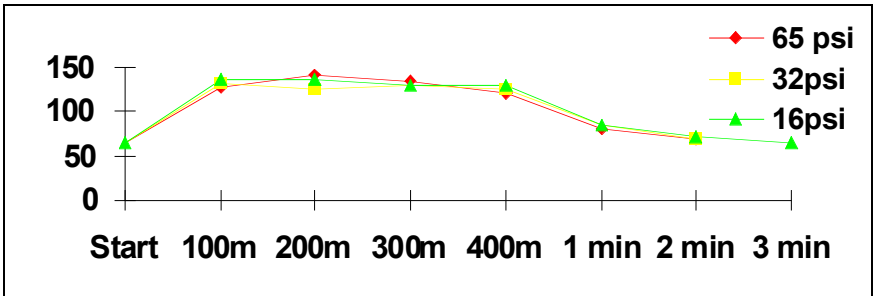
For example.
We took issue with the statement that most people don't notice air loss until pressure is down to 50% in the Tire Pressure Facts. It was our belief that tire pressure was much more critical to optimal performance and that most people would notice a reduction of 10% (5-10 psi). We therefore created a few tests to challenge the statement.

Distance a loaded chair rolled on a flat surface from a fixed ramp.



We noted hardly any reduction in distance rolled with the tire pressure at 50%. Most of the deterioration appeared to occur in the last 15%. So we decided to test a wheelers pulse rate and the time taken to complete a 400 metre circuit at various tire pressures.

Pulse and time taken to complete a 400 m course

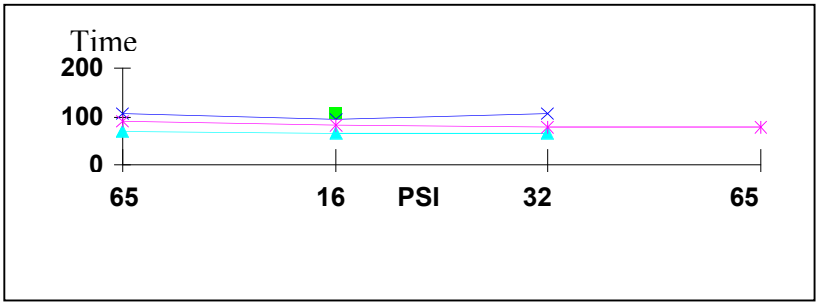


It took 2m 46s to complete at 65 psi and 32 psi and 2m 52

s to complete at 15 psi, hardly any difference at all.

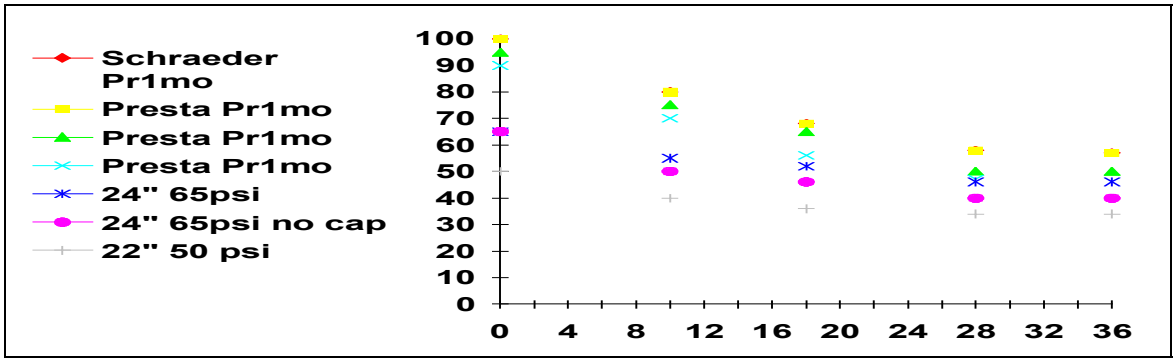
Our research indicated that air resistance was a bigger factor at speeds above 2m/s and rolling resistance was more of a factor at speeds below 2m/s. So we recruited three volunteers whose top speeds were less than 2 m/s.

Time taken for four volunteers to complete four wheeling tests at 65 psi, 32 psi ,16 psi and again at 65 psi:



Once again we found our preconceptions confounded by testing. None of the testers showed any diminution in performance with reduced tire pressure. So if you can get close to optimal performance with a tire that is only half inflated how often do tires have to be reinflated.

Air loss over a 5 week period for commonly available wheelchair tires.



After 5 weeks none of the tires had lost 50 % of their air, hence we recommend that pneumatic tires should be inflated once a month to ensure good performance. This information is particularly valuable to marginal wheelers and consumers who will benefit from the superior performance of pneumatic tires but are tempted by the low maintenance aspect of solid alternatives.

These are just samples of some of the factors that contribute to the overall performance of a manual wheelchair the workshop will provide you with an opportunity to discuss these factors and many more as well as a chance to feel the difference in performance that can be achieved by making simple adjustments.