

## **The Effect of Out-of-Round Wheels Versus True Round Wheels on Energy Costs of Pushing a Wheelchair**

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### ABSTRACT

**Introduction:** It has been assumed that true round wheels are to be preferred compared to out-of-round or untrue wheels. Bicycle and car wheels are balanced and “trued” to ensure a smooth ride and railway wheels that are out-of-round are known to damage the track and railcars. However, there has been very little research on the impact of out-of-round wheels on the mobility or energy cost of wheelchair users. Inexpensive out-of-round bicycle wheels are utilized on some wheelchairs designed for low-resource settings; any impact on mobility would affect those riding in and those assisting by pushing the wheelchair. We hypothesize a study with able bodied wheelchair pushers could give some indication of the impact of out-of-round wheels on assistant pushers. **Procedures:** Participants (25, 11M, 14F, mean age 22.6, SD+/- 2.37) were able-bodied university students. Protocol was approved by the IRB and class participants gave verbal consent and were free to withdraw at any time. Two identical wheelchairs intended for use in less-resourced settings were obtained. The out-of-round wheels on one were replaced with true bicycle wheels. A repeated measures study design was used with participants pushing each wheelchair occupied by a 75 kg test dummy for a six minute timed walk test (TWT). Heart rate and ml O<sub>2</sub>/min (VO<sub>2</sub>) were measured for the last 4 minutes of each test and participants completed two visual analogue scale (VAS) questions after each test rating the ease/difficulty and awkwardness. Order of wheelchair condition was randomized and participants rested between trials. **Results:** 15 of the 25 participants completed the VAS questionnaire. Comparison of the means indicated that the qualitative results for the VAS question regarding awkwardness differed with out-of-round wheels being rated as more awkward. Comments indicated more wobble and more noise. **Conclusion:** It would seem that out-of-round wheels are awkward. However, for the degree of out-of-roundness in the wheelchair wheels utilized in this study, energy cost was not affected.