

## Comparing energy cost and maneuverability for pushers of two pediatric wheelchairs designed for low-income countries

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### ABSTRACT

**Summary:** Our study compared two pediatric wheelchairs designed for less resourced settings, a wheelchair made by the Association of the Physically Disabled of Kenya and the Regency chair made in the US and distributed globally. The Regency chair outperformed the APDK chair in most aspects measured. **Introduction:** Many wheelchairs are donated to less-resourced countries by well-meaning organizations without regard to local, cultural, and physical conditions and without ensuring appropriate knowledge, tools, and support are present<sup>1</sup>. In the last ten years, several organizations have been manufacturing and distributing wheelchairs designed for low-income countries, however few outcomes studies have been done on these chairs. We completed a set of tests to compare two pediatric wheelchairs that are currently distributed in Kenya for children with disabilities. By providing accurate outcomes measures to manufacturers, we hope to enable design improvements<sup>2</sup>. **Materials and Methods:** During the 2010-2011 school year, local high school students pushed first graders sitting in the chairs on two surfaces (sidewalk and gravel drive) for six minutes. From heart rate data collected and distance covered, physiological cost indexes were calculated for pushing both chairs and time-walk test comparisons were made. In addition, a series of timed maneuverability tests from the Wheelchair Skills Test were performed, up and down a curb, up and down a ramp, and in a figure eight pattern<sup>3</sup>. Subject input was obtained by a visual analogue scale question and an opportunity to comment on each test. **Results:** Paired T tests showed that the APDK chair required significantly more energy to push than the Regency chair on both rough and smooth surfaces, and that the APDK chair was perceived as significantly harder to push on both terrains as well as more difficult to maneuver around tight spaces. **Discussion:** Results favored the Regency chair in all tests with significant differences. User comments indicated issues with the APDK chair about manufacturing quality control such as wobbling wheels due to lack of alignment and asymmetrically assembled frames. Results from this study as well as from a parallel study in Kenya have been provided to manufactures and on-going discussion is underway.

