TACSM Abstract

A comparative study of the energy cost and maneuverability for pushers of two pediatric wheelchairs designed for use in low income countries

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Category: Undergraduate

ABSTRACT

Introduction: Many wheelchairs are donated to developing countries without proper consideration of physical, cultural, and social needs[1]. Many children in wheelchairs around the world are unable to self-propel and are dependent on assistants to push their wheelchairs. Organizations designing wheelchairs for low-income countries are eager for outcomes research to inform design. We are performing a set of comparative tests on two pediatric wheelchairs designed for less-resourced settings, the Hope Haven KidsChair built in Guatemala, and a pediatric wheelchair built in Kenya by the Association of the Physically Disabled of Kenya (APDK). This is a partner study to a long term field study done in Kenya. Our results will give quantitative feedback to the manufacturers, with the goal of facilitating design improvements to the pediatric wheelchairs. **Materials and methods:** In our study comparing the KidsChair and the APDK chair, volunteer college students completed six tasks: pushing each of the wheelchairs on rough and smooth ground, up and down a curb and ramp, on a track at a constant speed, and through a figure eight. The curb, ramp, and figure eight timed maneuverability test came from the Wheelchair Skills Test[2]. Fifty pounds of weight were placed on the chair to simulate the weight of a child. Physiological Cost Indices (PCI) and Time Walk Tests (TWT) were used to record the energy cost of pushing the wheelchairs. Additionally, each volunteer was asked to place a mark on a Visual Analogue Scale (VAS) questionnaire to give user input on the difficulty of each task. **Preliminary Results:** Paired T tests of PCI, TWT and questionnaire data indicated the APDK chair outperformed the KidsChair on rough ground. Questionnaire data indicated the KidsChair outperformed the APDK chair on smooth ground. Subjects indicated it was significantly easier to push on smooth ground and up and down a ramp on the VAS questionnaire. **Discussion**: Preliminary results seem to indicate that the APDK chair may be better suited for rough ground than the KidsChair. However, in the comment section of the VAS questionnaire, the APDK chair was repeatedly criticized for poor construction, suggesting that there may be need for improvement in manufacturing quality control. For the KidsChair, users mentioned front castors and stoppers caused difficulty maneuvering on rough ground. In May, we are planning to perform a parallel study at Joytown, a boarding school for children with disabilities in Kenya.