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ABSTRACTS FROM CONFERENCE PRESENTATIONS (2003 – 2005)

Energy expenditure of modified wheelchair propulsion systems: A case study. Newsam CJ, Requejo PS, Mulroy SJ. *J Spinal Cord Med* 2005:28(2):152.

Objective: To measure energy expenditure of manual wheelchair (WC) propulsion using standard and commercially available alternative propulsion designs.

Design: Case study; repeated measures.

Participant: A 41 year-old man with T12 complete paraplegia (ASIA-A) for 17 years.

Methods: Energy expenditure was measured during 20-minutes of WC propulsion at a self-selected pace over a 126-meter outdoor track using the COSMED Portable Gas Exchange system. Three methods of manual WC propulsion were tested: standard manual WC, power-assisted pushrim-activate wheelchair (PAPAW), and lever driven WC propulsion. The following measures were recorded: propulsion speed, cadence, cycle length, heart rate, O_2 rate, and O_2 cost.

Results: Propulsion speed averaged 105 m/min during the standard WC test. Propulsion speed increased by 36% in the PAPAW condition (143 m/min) as a result of increased cycle length (2.8 vs. 2.3 meters). During lever WC propulsion, speed increased by 8% (114 m/min), however, increased cadence (63 vs. 45 cycles/min) and decreased cycle length (1.8 meters) were recorded. During PAPAW propulsion, heart rate and O_2 rate were similar to standard WC propulsion. O_2 cost, however was reduced by 22% (0.076 vs. 0.097 ml/kg-meter). By contrast, lever WC propulsion had increased heart rate (147 vs. 114 bpm), O_2 rate (17.1 vs. 10.2 ml/kg-min), and O_2 cost (0.15 ml/kg-meter) compared with standard WC propulsion.

Conclusion: For this subject, PAPAW propulsion was a more efficient mode of travel (increased speed and decreased energy cost) whereas lever WC propulsion increased demand. Ongoing efforts are investigating the energy demands of these alternative WC propulsion systems in marginal WC users.

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