Wheels Project

RELIABILITY AND DISCRIMINATORY VALIDITY OF THE PRELIMINARY VERSION OF THE WHEELCHAIR COMPONENTS QUESTIONNAIRE FOR USERS

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Introduction

Outcomes studies are necessary for more appropriate and financially responsible provision of wheelchairs[1,2]. Currently, there is a lack of research that includes the user/customer opinion in mobility devices, which may contribute to the high incidence of inappropriately fitted equipment[3,4]. User perception of wheelchair design and condition are essential to their production and improvement, however most patient reported outcomes measures for wheelchair users are aimed primarily at assessing quality of life rather than the wheelchair itself, and the user's input on his or her wheelchair may be blurred by other factors impacting quality of life[3]. The preliminary version of the Wheelchair Components Questionnaire for users (WCQu) was designed as a patient-reported outcomes measure that will enable wheelchair users to provide feedback on their satisfaction with the function of the components of their wheelchair. It was based on the WCQ for condition, a professional report outcomes measure on the maintenance condition of wheelchair components[5]. To be of general use, a questionnaire must be validated for reliability and discriminatory validity.

Purpose

The purpose of this study was to investigate the following research questions:
1. Does the WCQu have good test and re-test reliability as indicated by having an Intra-class Correlation Coefficient (ICC) value higher than 0.7 when comparing mean scores?
2. Does the preliminary version of the WCQu have good discriminatory power?
   a. Is the data distribution of the visual analogue scores suitable for use with parametric statistical analysis tools such as analysis of variance (ANOVA)?
   b. Does two way ANOVA and Tukey simultaneous comparison of means have the power to discriminate between wheelchair types by indicating a significant difference in mean scores for different wheelchair types?

Methods

Secondary school aged wheelchair users at a boarding school for students with disabilities in a low resource area were invited to complete a preliminary version of the Wheelchair Components Questionnaire for users (WCQu). The WCQu is a patient reported outcomes measure with 10 domain related questions and 7 extended questions (Table 1). Each question concerns a wheelchair component and consists of a visual analogue score rating with an accompanying explanatory comment (Figure 2). Study protocol was approved by all appropriate parties. Wheelchairs in use had been provided based on types available to clinicians serving the students at this site. ICC was calculated from qualifying data. Two way ANOVA and Tukey's simultaneous comparison of means was completed for scores from all items of data.

Results

A total of 46 participants completed the WCQu once, and 26 participants successfully completed the WCQu a second time four days later (mean age 17.7 SD 2.8). Very few participants' wheelchairs included the components in the seven extended questions so reliability could only be determined for the 10 domain specific questions. Anderson Darling analysis indicated data was statistically normal and suitable for use with parametric statistical analysis tools. Evaluation of the domain specific question items resulted in ICC values of 0.937 with a confidence interval of 0.927 to 0.985. Results indicated that this version of the WCQu was able to discriminate between wheelchair types ($P<0.001$) and Tukey simultaneous comparison of means indicated that highest ratings went to Motivation rough terrain chairs and lowest rating to Chinese made folding transport chairs (Figure 3). ANOVA indicated that the WCQu was also able to distinguish between components ($P<0.001$) with highest ratings for frame and uprights, and lowest ratings for casters, footrest, seat and brakes (Figure 3).

Discussion

Test re-test reliability validation was achieved for the domain specific questions of the preliminary version of the WCQu with an ICC score above 0.7. ANOVA using data from 46 participants indicated that the WCQu was able to discriminate between wheelchair types. Reliability of the extended questions was not confirmed because few of the wheelchairs included those parts. Plans are underway to reorganize the extended questions into the domain specific questions and revalidate the WCQu in that format. Researchers recognized that some participants were not familiar with the technical names of their wheelchair parts. Future studies will include the simplification of the language in the questionnaire. Good reliability and discriminatory ability indicates that the domain related questions of the preliminary version of the WCQu provide a patient reported outcomes measure which enables wheelchair users to give feedback on wheelchair components as well as the user's overall satisfaction. In a clinical setting, the rating and accompanying explanation could enable repair or modification of a component that the client might not have mentioned without the WCQu. Equally important, the results of this questionnaire can be made available to manufacturers and providers. Ratings and comments can shed light on problems to be addressed by design changes.

Figure 1. Study participants complete the WCQu.

Table 1: Questions of the preliminary version of the WCQu. Each one also included the phrase "from below F, (I am very dissatisfied) to above A, (it's perfect for me. I love it!)."

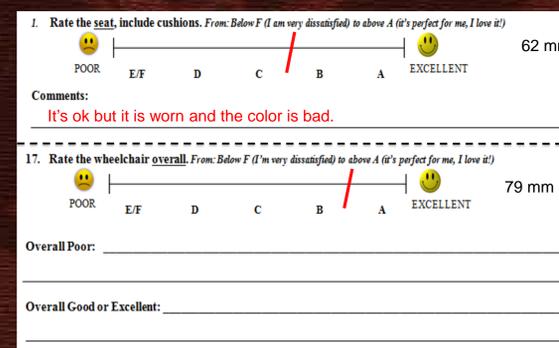| Domain Specific	Extended
Rate the seat, include cushions	Rate the lap belt and/or harness
Rate the seat back, include cushions	Rate the head support
Rate the frame	Rate the trunk supports
Rate the uprights and handles (canes)	Rate the hip supports
Rate the front rigging and foot support	Rate the anti-tip device
Rate the casters	Rate the tray
Rate the wheels and push rims	Rate the arm rests
Rate the wheel locks (brakes)	Rate the abductor and/or adductor
Rate the wheelchair overall	

Figure 2. Sample questions from the WCQu.
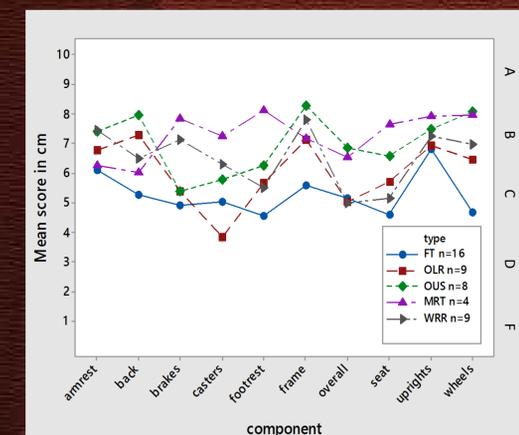

Figure 3. ANOVA interaction plot for wheelchair types: Folding transport chair (FT), Motivation Rough Terrain (M…), Whirlwind Roughrider (WRR), Other chairs made for low resource settings (OLR), and Other chairs made in the USA (OUS).

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3 Mortenson, W. B., Miller, W. C., & Auger, C. (2008). Issues for the Selection of Wheelchair-Specific Activity and Participation Outcome Measures: A Review. Archives of Physical Medicine and Rehabilitation, 89(6), 1177-1186.
4 Stanley, R. K., Stafford, D. J., Rasch, E., & Rodgers, M. M. (2003). Development of a Functional Assessment Measure for Manual Wheelchair Users. Journal of Rehabilitation Research and Development, 40(4), 301-307.
5 Rispin, K., Dittmer, M., McLean, J., Wee, J. (2016). Reliability and Sensitivity of the Wheelchair Components Questionnaire for Condition, 32nd Annual International Seating Symposium, Vancouver, BC, Canada.

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