CPOJ OPEN ACCESS
ABSTRACT (ORAL PRESENTATION)
AOPA'S 101 ST NATIONAL ASSEMBLY ABSTRACTS, SEPTEMBER 26-29, VANCOUVER, CANADA, 2018

ESTABLISHING THE RELIABILITY AND VALIDITY OF THE COMPONENT TIMED-UP-AND-GO TEST TO DETERMINE BASIC PROSTHETIC MOBILITY IN PEOPLE WITH LOWER LIMB AMPUTATION

Sheila Clemens[*1,2], Ignacio Gaunaurd [1,2] ,Jennifer Lucarevic[2], Glenn Klute[3], Neva Kirk-Sanchez[2], Christopher Bennett[4], Robert Gailey[1,2]

[1] Miami VA Healthcare System, Miami, FL, USA.
[2]Department of Physical Therapy, University of Miami, Coral Gables, FL, USA.
[3]Rehabilitation Research and Development, VA Puget Sound Health Care System, Seattle, WA,USA.
[4]Music Engineering Technology Program, University of Miami, Coral Gables, FL, USA.
* Email: clemens.sheila@gmail.com

DOI: https://doi.org/10.33137/cpoj.v1i2.32036

INTRODUCTION

Studies suggest that brief bouts of activity consisting of sit-to-stand transitions, gait initiation, turning and negotiation of obstacles, are essential tasks of daily mobility, as well as prosthetic mobility[1,2]. Using outcome measures deemed reliable for use in the amputee population is ideal[3,4]. The purpose of this study was to investigate the reliability and validity of a component timed-up-and-go test (cTUG), using a mobile application (App), to evaluate basic prosthetic mobility tasks in people with lower limb amputation (LLA). The cTUG captures time required to perform the subtask components of sit to stand transitions, linear gait, and a 180˚ turn that are requisites of the standard TUG test. It was hypothesized that the cTUG would demonstrate test-retest reliability, differentiate between groups based on anatomical level of amputation, and exhibit convergent validity with other measures of prosthetic mobility and balance.

METHODS

Subjects performed 4 trials of the cTUG; turning twice toward and away from their prosthetic limb. The cTUG was performed on top of a sensored gait mat to capture additional gait parameters. A total time to perform the test was recorded, as well as 5 component times: 1) sit to stand, 2) walk entering the turn, 3) 180 degree turn, 4) walk exiting the turn, 5) turn to sit. A custom mobile application was used to capture the time intervals. All data was recorded using an iPad Air 2.

RESULTS

A convenience sample of 118 individuals with LLA. All participants had non-vascular cause of unilateral LLA at the transtibial (TTA) or transfemoral (TFA) level, and were between 18-80 years old, ambulating a minimum of 8 m independently. Groups were compared based on their level of amputation. The mean age of the cohort was 48.1 years, comprised of 54% males, with 53% having TFA. Test-retest analyses resulted in an ICC=.98 (F=.19; 95% CI .97, .99) for the total performance time, and ICCs ranged from .71-.94 for each component time. Moderate correlations existed between the cTUG and PLUS-M (r_s= -.56) suggesting convergent validity. Significant differences existed between the TTA and TFA groups ($p<.05$) for total time and each component time of the cTUG suggesting known-groups validity. Additionally, it was determined that people with TFA use different strategies to turn 180˚ compared to those with TTA.

Table 1. Known-groups validity of the cTUG

Variable	TT (n=55) Mean ±SD (Range)	TF (n=63) Mean ±SD (Range)	p value
Subject age (y)	49.5 ± 12.1 (24.3-72.6)	47.0 ± 15.0 (19.1-74.0)	.19
Waist (cm)	102.4 ± 15.6 (64-139.0)	101.1 ± 17.8 (68.5-142.0)	.20
cTUG (s) Total time	10.0 ± 2.3 (6.7-16.8)	12.8 ± 5.0 (7.8-33.1)	<.001
cStand	1.6 ± .4 (.9-2.8)	2.1 ± 1.5 (.51-10.0)	.01
cWalk	1.7 ± .5 (1.0-3.4)	2.2 ± .8 (1.3-6.0)	<.001
cTurn	2.7 ± .7 (1.7-4.5)	3.5 ± 1.2 (2.1-7.8)	<.001
cReturn	1.6 ± .4 (1.0-2.4)	1.9 ± .5 (1.1-4.2)	.001
cSit	2.4 ± .7 (1.3-4.5)	3.1 ± 1.6 (1.4-10.5)	.001
ABC	89.6 ± 14.1 (41.3-100.0)	84.5 ± 15.1 (28.0-100.0)	.004
PLUS-M	60.9 ± 8.7 (37.7-71.4)	56.0 ± 8.1 (36.4-71.4)	.001
	Median (IQR) (Range)	Median (IQR) (Range)	
Number of steps cTurn	5 (6-5) (3-8)	6 (7-5) (4-12)	<.001

CONCLUSION

The cTUG is a reliable and valid measure of basic prosthetic mobility in community-dwelling people with LLA. This study found differences between people with TFA as compared to TTA in the cTUG total time and all components times, confirming that basic prosthetic mobility skills vary between levels of amputation.

SIGNIFICANCE

An instrument for measurement of prosthetic mobility, the cTUG, has been developed for use on people with LLA. Preliminary psychometric analyses indicate excellent reliability and validity for use in the amputee population, providing a powerful clinical tool.

REFERENCES

1. Orendurff et al. How humans walk: Bout duration, steps per bout, and rest duration. *J Rehabil Res Dev*,2008; 45, 1077-89. DOI: 10.1682/JRRD.2007.11.0197

2. Bussman J, Schrauwen HJ, Stam HJ. Daily physical activity and heart rate response in people with a unilateral traumatic transtibial amputation. *Arch Phys Med Rehabil*. 2008; 89, 430-4. DOI:10.1016/j.apmr.2007.11.012

3. Resnik L, Borgia M. Reliability of outcome measures for people with lower-limb amputations: distinguishing true change from statistical error. *Phys Ther*. 2011; 91, 555-65. DOI:10.2522/ptj.20100287

4. Deathe et al. Selection of outcome measures in lower extremity amputation rehabilitation: ICF activities. *Disabil Rehabil*. 2009; 31, 1455-73. DOI: 10.1080/09638280802639491