

AM-PAC® BASIC MOBILITY INPATIENT SHORT FORM (LOW FUNCTION)
PSYCHOMETRICS/CLINIMETRICS

By

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Abstract

Objective: To determine whether the Activity Measure for Post-Acute Care® Basic Mobility Inpatient Short Form (Low Function) (6-clicks LF) has increased responsiveness for patients with lower levels of physical function compared to the Activity Measure for Post-Acute Care Basic Mobility Inpatient Short Form (6-clicks).

Design: Retrospective cohort study using original scores and simulated scores for assessment of internal responsiveness of the 6-clicks LF compared to the 6-clicks. Simulated 6-clicks and 6-clicks LF scores were created as a hypothetical future AM-PAC® score.

Results: We found a statistically significant difference between the 6-clicks and simulated 6-clicks, $t=24.8$, $p<0.00$ [two-tailed]. The effect size was large ($d=1.2$, $r=0.51$). There was a statistically significant difference between the 6-clicks LF and simulated 6-clicks LF, $t=19.7$, $p<0.00$ [two-tailed]. The effect size was medium ($d=0.91$, $r=0.41$). Finally, for patients with a 6-clicks score in the bottom five-percentile ($n=27$), we found a statistically significant difference between the 6-clicks and 6-clicks LF, $t=11.9$, $p<0.00$ [two-tailed].

Conclusion: Among patients scoring less than 15, the 6-clicks LF has greater internal responsiveness than the 6-clicks and thus demonstrates that the new low-level questions in the 6-clicks LF better quantify low-level patients' functional level. Research using non-simulated data should be completed in the future to confirm these findings.

Table of Contents

Abstract.....	iii
Section 1: Introduction.....	1
Section 2: Methodology.....	4
Section 3: Results.....	8
Section 4: Discussion.....	11
Conclusion.....	13
References.....	14
Curriculum Vitae.....	16

Section 1: Introduction

Patients with critical illnesses admitted to a hospital have been shown to stay in bed for over 80% of their hospital stay.¹ This immobility is one of the leading factors of Hospital-Acquired Disability (HAD) which is defined as functional loss acquired during hospitalization.¹ Immobility is more prevalent in the Intensive Care Unit (ICU) where patients require extensive monitoring for airway support, breathing or circulation; stabilization of serious acute or life-threatening illnesses; or end of life care.² In this setting, rapid deterioration of muscle strength and function are concerning impairments³ and are predictors of hospital length of stay (LOS), hospital discharge, post-discharge survival, healthcare utilization, and quality of life (QOL).⁴⁻⁶

The International Classification of Functioning (ICF) is a conceptual framework comprising three health domains: participation restrictions, activity limitation and functional impairments.⁷ The ICF model is a means of organizing the thinking about contributors to physical function such as muscle strength, activity limitations and participation restrictions, all three of which are strongly interrelated.² Muscle mass is a passive outcome that quantifies muscle morphology and can relate to muscle strength.⁸ Muscle strength is an active measure that provides more information about a patient's level of impairment.² The most complex and most patient-centered measure is that of function which provides the greatest detail on a person's activity limitations.²

According to the ICF, functioning is defined by the interplay of body function and structure, and activities and participation.⁷ Evaluating functioning with ICF language and thinking encourages use of performance based measures of limitations in certain activities.⁷ The evaluation of physical function is important in the ICU in order to monitor condition, identify

high risk patients, monitor efficacy of rehabilitation interventions and inform discharge planning.^{5,9,10} Identifying levels of function are more complex in the ICU due to the medical conditions and treatments that limit assessment.³

In the acute care setting, there are a limited number of outcome measures that evaluate functional impairment in the critically ill with established psychometric properties.² Clinical outcome measures must be reliable, valid, and responsive.¹¹⁻¹³ Responsiveness is the degree to which an instrument is able to detect a true change that is clinically meaningful or statistically significant over time.¹² Without an outcome measure with good psychometric properties, too much variability, error, and bias can enter into clinical recommendations for patient care.¹⁴

An outcome measure with good evidence for its validity¹⁰ and reliability¹⁵ for evaluating mobility limitations in acute care settings is the Activity Measure for Post-Acute Care Inpatient Mobility Short Form (6-clicks), one of three “6-clicks” short forms.¹⁶ Mobility is part of the ICFs’ functional domain as it has been associated with a decrease in both muscle weakness and physical awareness.¹⁷ This short form is advantageous over other instruments for acute care patient populations because it measures a patient’s functional capabilities and is also simple and quick for the healthcare provider to complete.¹⁸ However, patients with low-level functioning often fall below the floor of the 6-clicks.⁹

Physical therapists and other healthcare practitioners working with acute care patients may see changes in the patient’s function but are unable to measure that change due to the floor effect of the current 6-clicks. As a result, two new questions were created that can be added to the 6-clicks creating the AM-PAC® Basic Mobility Inpatient Short Form (Low Function) (6-clicks LF).⁹ The addition of these two new questions to the 6-clicks allows patients with lower level functioning to be measured objectively on the same scale as the 6-clicks. However, the

psychometric properties of the 6-clicks LF have yet to be fully established. Our purpose was to measure the responsiveness of the 6-clicks LF.

Project Aim and Hypothesis

Specific Aim: To determine whether the 6-clicks LF has increased responsiveness for patients with lower levels of physical function compared to the 6-clicks.

Hypothesis: The AM-PAC® Basic Mobility Inpatient Short Form (Low Function) will be more responsive than the AM-PAC® Inpatient Mobility Short Form.

Section 2: Methodology

We utilized a retrospective cohort design with data collected from the electronic medical records of Johns Hopkins Hospital (JHH) and the University of Pittsburgh Medical Center (UPMC). This study was recognized at both institutions as Quality Improvement by their respective Institutional Review Boards with a consent waiver.

These hospitals collected both the 6-clicks and 6-clicks LF on 534 patients, one time, during hospitalization. Both, the 6-clicks and 6-clicks LF consist of mobility questions that are each scored on a 1-4 ordinal scale. The 6-clicks consist of six questions. The 6-clicks LF has two additional questions, resulting in eight total questions. Therefore, the 6-clicks LF (Table 1) and 6-clicks LF (Table 2) have raw scores of 6-24 and 8-32, respectively. For each patient, their raw total score was converted into an AM-PAC® t-scale score (t-score). These t-scores were used for statistical analysis.

The AM-PAC® Basic Mobility Inpatient Short Form Score Conversion Table		
AM-PAC® Raw Score	AM-PAC® T-Scale Score	Scale Score Standard Error
6	16.59	3.18
7	19.39	3.27
8	22.61	3.23
9	25.8	2.96
10	28.13	2.78
11	30.25	2.66
12	32.23	2.57
13	33.99	2.51
14	35.55	2.49
15	36.97	2.48
16	38.32	2.46
17	39.67	2.44
18	41.05	2.42
19	42.48	2.46
20	43.99	2.6
21	45.55	2.87
22	47.4	3.31
23	50.88	4.44
24	57.68	6.67

Table 1: The AM-PAC® Basic Mobility Inpatient Short Form Score Conversion Table

The AM-PAC® Basic Mobility Inpatient Short Form (Low Function) Score Conversion Table		
AM-PAC® Raw Score	AM-PAC® T-Scale Score	Scale Score Standard Error
8	10.37	4
9	12.55	3.87
10	14.65	3.66
11	16.55	3.48
12	18.33	3.37
13	20.14	3.32
14	22.01	3.31
15	23.9	3.24
16	25.72	3.08
17	27.46	2.89
18	29.25	2.76
19	31.06	2.65
20	32.8	2.56
21	34.39	2.5
22	35.85	2.48
23	37.22	2.47
24	38.53	2.46
25	39.85	2.43
26	41.2	2.42
27	42.6	2.47
28	44.1	2.61
29	45.67	2.89
30	47.58	3.38
31	51.1	4.54
32	57.76	6.67

Table 2: The AM-PAC® Basic Mobility Inpatient Short Form (Low Function) Score Conversion Table

Simulated 6-clicks and 6-clicks LF scores were created (using Excel, version 2103; Microsoft Inc) as a hypothetical future AM-PAC® score so that each patient had two AM-PAC scores. This was accomplished mathematically by taking a random value between sixty-five percent and one-hundred percent of the collected AM-PAC® score and four. Sixty-five percent was used as the floor as the research team concluded that approximately thirty-five percent of patients would decrease in function during hospital length of stay. Four was used as the ceiling as a small percentage of patients would achieve a perfect AM-PAC® score during hospital length of stay.

Two paired sample t-tests were conducted and will be referred to as Test 1 and 2 for ease of reference. One independent sample t-test was conducted and will be referred to as Test 3 for ease of reference. Test 1 compared the 6-clicks to the simulated 6-clicks. Test 2 compared 6-clicks LF to the simulated 6-clicks LF. Tests 1 and 2 test the difference between the group mean of these two scores, indicating change across the simulated time points. Additionally, the effect size of Test 1 and 2 was computed using Cohen's d.

In Test 3, 6-clicks and 6-clicks LF scores were compared. This was done to estimate internal responsiveness of the 6-clicks LF. A subpopulation (n=32), from the lowest functioning five percent of the 6-clicks population was utilized for this analysis. This cutoff was chosen, as only the patients at the lower end of functional mobility benefit from the 6-clicks LF. All analyses were conducted using SPSS (version 26.0; SPSS Institute Inc), and a $P < .05$ was used to determine statistical significance.

Section 3: Results

The sample population of our study included 534 total patients. Average 6-clicks and 6-clicks LF t-scores were 31.94 and 31.90, respectively. Average simulated 6-clicks and 6-clicks LF scores were 40.02 and 38.23, respectively. Additionally, thirty-two patients scored less than 15 on the 6-clicks t-score.

In Test 1 (fig 1), we found a statistically significant difference between the 6-clicks (mean=31.9, SD=8.7) and simulated 6-clicks (mean=40.0, SD=3.9), $t=24.8$, $p<0.00$ [two-tailed]. The effect size was large ($d=1.2$, $r=0.51$).

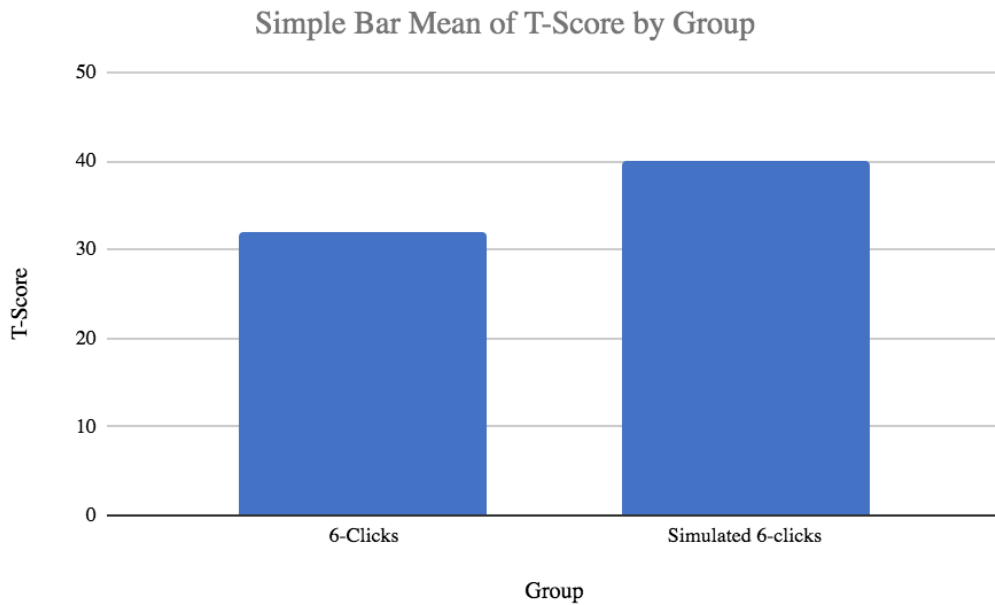


Figure 1: Test 1: 6-clicks compared to simulated 6-clicks

In Test 2 (fig 2), we also observed a statistically significant difference between the 6-clicks LF (mean=31.9, SD=9.0) and simulated 6-clicks LF (mean=38.3, SD=4.2), $t=19.7$, $p<0.00$ [two-tailed]. The effect size was medium ($d=0.91$, $r=0.41$).

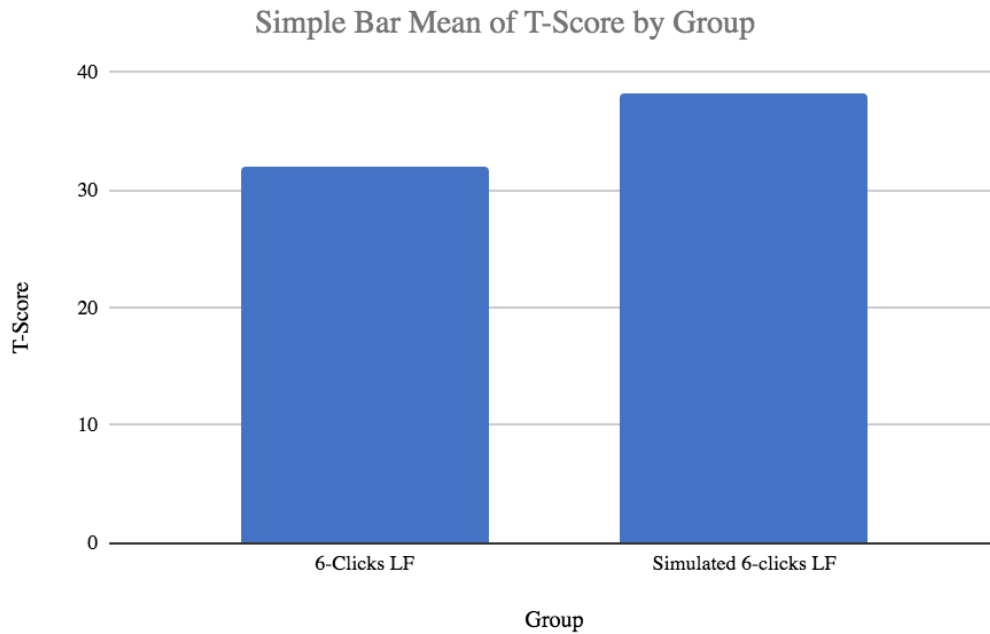


Figure 2: Test 2: 6-clicks LF compared to simulated 6-clicks LF

In Test 3 (fig 3), for patients with a 6-clicks score in the bottom fifth percentile, we found a statistically significant difference between the 6-clicks (mean=16.6, SD=.0) and 6-clicks LF (mean=11.9, SD=2.0), $t=11.9$, $p<0.00$ [two-tailed].

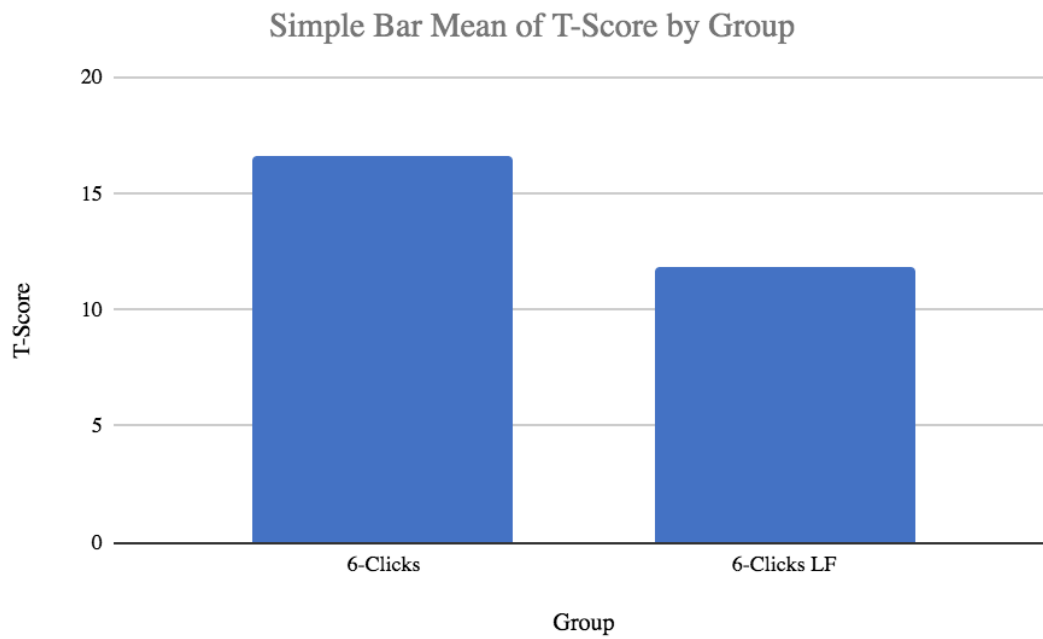


Figure 3: Test 3: 6-clicks compared to 6-clicks LF

Section 4: Discussion

Our study purpose was to determine if the 6-clicks LF has increased responsiveness for patients with low levels of physical function compared to the 6-clicks. Patients scored significantly higher on both the 6-clicks and 6-clicks LF forms over time. This was to be expected, as the creation of the simulated data was designed with a greater average score to represent the expected improvement in patients' functional mobility during their hospital length of stay. The effect size of the differences between observed and simulated AM-PAC® scores were medium to large. We observed that there was a significant difference in the AM-PAC® 6-clicks LF scores compared to the 6-clicks assessments among patients with lower physical function. In our sample of hospitalized patients there were 5% who would fall into this very low function group and benefit from these additional questions. As low level functioning patients are likely to be the most in need of diligent monitoring and screening due to their increased risk of decline when afflicted with acute critical illness,¹⁹ regular assessment of physical function among this group of patients is paramount. From the results of the simulated data, the 6-clicks LF offers increased responsiveness for patients with lower levels of physical function compared to the 6-clicks but not among patients with higher levels of function. Thus, based on our current simulated data, we would recommend using the 6-clicks LF rather than the 6-clicks for physical function assessment with low level functioning patients.

Our methods tested simulated functional improvement within a cohort of patients designed to represent the passage of time. This comparison of statistical difference can indicate “internal responsiveness”²⁰ or “homogenous change”,²¹ the ability of a measure to quantify change over time.²⁰ Regression models can be used to determine heterogenous change²¹ or “external responsiveness” which estimate the ability of change in a measure such as the 6-clicks

LF to represent change in another indicator of the patient's health status.²⁰ We were unable to test for external responsiveness as we did not have data from another measure. For other researchers planning to test responsiveness with an external standard, we suggest caution as there is a chance that the external standard and the new instrument (6-clicks LF) are measuring different, even if related, constructs which would hide the responsiveness of the 6-clicks LF.²¹

We experienced many challenges in the course of this study. Our original plan was to use 6-clicks LF, 6-clicks LF, and FSS-ICU data collected at the Johns Hopkins Hospital (JHH) from at least two points in time. We experienced delays in obtaining approval for data sharing from JHH. One reason for these delays was the COVID-19 pandemic which caused all non-essential research at JHH to stop. Given this significant delay, we had to modify our methods. Our simulated data may or may not represent actual patient function and so our results should not be seen as conclusive evidence for responsiveness of the 6-clicks LF. Future research should be conducted with prospectively collected patient data.

Conclusion

The 6-clicks LF has greater internal responsiveness than the 6-clicks among patients scoring less than 15 on the 6-clicks. The new low-level questions in the 6-clicks LF capture more information about the function of low-level patients than the 6-clicks. More research on the responsiveness of the 6-clicks LF should be conducted with prospectively collected, non-simulated data.

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