Four Square Step Test (FSST): Reference Guide
Outcomes Committee Resource created by Tyler Klenow, MSOP and Brian Kaluf, BSE, CP

Introduction
One of the main goals of orthotic and prosthetic interventions is to improve function through mobility. The four square step test (FSST) is an outcome measure that is designed to assess a subject’s dynamic stability and ability to step over small objects forward, laterally, and backward.¹

Establishing Author: Dite W, Temple VA. (2002)  
Data Type: ratio
Measurement Type: performance-based outcome measure  
Assessment Type: observer

Psychometric Properties
Outcome measures can improve the quality of clinical evaluations and notes as well as offer a reference for patient progress. The four square step test has been shown to have strong psychometric properties in a variety of populations, including transtibial amputees, geriatrics, individuals with Parkinson’s disease, and acute stroke.¹,²,³,⁴

Reliability. Excellent test-retest reliability was found for post-stroke subjects in two week testing intervals, from initial admission to four weeks, with great statistical significance (p<0.01).¹ Excellent reliability was also noted in the geriatric population and in patients with Parkinson’s disease, both on and off medication.¹,³ Inter-rater reliability was excellent in geriatric and Parkinson’s disease populations.¹,³

Validity. Concurrent validity was determined to be excellent in the geriatric population between the four square step test and both the step test and timed up and go (TUG, with r=-0.83 and r=0.88, respectively). Fair concurrent validity was found between FSST and the functional reach test in the geriatric population, with r=-0.47.¹ Fair concurrent validity between the FSST and both the 6-minute walk test (6MWT) and 5 times sit to stand was determined when testing subjects with Parkinson’s disease. The Spearman’s correlations were found to be r=-0.52 and r=0.58, respectively, in those tests.³ A floor effect for the FSST was discovered when testing the acute stroke population, where 40-62% of participants had at least one unsuccessful trial in testing at initial admission, 2 weeks, or 4 weeks from an accident.⁴

Responsiveness. Among unilateral transtibial amputees, a predictive threshold time of 24 seconds for the FSST was established as the time that distinguished multiple fallers from non-multiple fallers, with a sensitivity of 92% and specificity of 93%. A longer time was found to identify multiple fallers 86% of the time in that population. A time equal to or faster than the threshold was found to identify the amputees as non-multiple fallers 96% of the time.² Threshold times for additional populations are shown in table 2.

<table>
<thead>
<tr>
<th>Outcome measure</th>
<th>Reliability</th>
<th>Validity</th>
<th>Responsiveness</th>
<th>Normative Data</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Test-Retest</td>
<td>Inter-rater</td>
<td>Intra-rater</td>
<td>MDC</td>
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<tr>
<td>FSST</td>
<td>yes</td>
<td>no</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>Single Limb Stance</td>
<td>yes</td>
<td>no</td>
<td>no</td>
<td>yes</td>
</tr>
<tr>
<td>Timed Up &amp; Go</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>L-Test</td>
<td>no</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
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The American Academy of Orthotists and Prosthetists
Outcomes Research Committee

Required Resources

Total Time: <3 minutes
Personnel: 1-2 persons
Equipment: a stopwatch and 4 canes or similar barriers
Space: approximately 4 square meters
Cost: free

Figure 1. Testing configuration. The subject begins standing in square 4.

Test Administration

The subject receives one demonstration and one practice trial. The subject then completes two trials, with the better time being recorded.

Interpretation

A shorter time to finish the test represents better dynamic stability and ability to step over small objects forward, laterally, and backward. Several threshold values of increased fall risk have been established in various populations using the four square step test.\(^1\,2,3,4\). These times, as well as other normative data, are shown below.\(^1\,4\). By comparing a patient’s test results with these values, clinicians can justify the prescription of orthotic or prosthetic interventions. Efficacy of treatment can be shown by:

- Surpassing a threshold of reduced fall risk.
- Returning a patient to a score that is average among a patient’s normal peers.

<table>
<thead>
<tr>
<th>Threshold Times Indicating Fall Risk by Population</th>
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<tbody>
<tr>
<td>Population</td>
</tr>
<tr>
<td>Lower Extremity Amputees</td>
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<tr>
<td>Geriatric Population</td>
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<tr>
<td>Acute Stroke</td>
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<tr>
<td>Parkinson’s Disease</td>
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<table>
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<tr>
<th>Balance and Mobility Times for Older Adults(^1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Multiple Fallers</td>
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<tr>
<td>32.6 sec +/- 10.1</td>
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1. Set up the canes or similar barriers to form a cross on the ground.
2. The subject begins in the lower left quadrant, square 4 as seen in figure 1.
3. Instruct the subject to step each foot in each square progressing clockwise and then counterclockwise to complete a trial. The subject should try to face forward the entire time.
4. Time the subject from initial contact in square 1 to the return of both feet in square 4 at the end of the sequence.
Limitations

This test is not intended for individuals who may fall during the implementation of this outcome measure due to extreme instability or balance impairments. In addition, a floor effect exists in that the test is able to be failed. It was found in the post-stroke population that 40-62% of participants had at least one unsuccessful trial in testing at initial admission, 2 weeks, or 4 weeks from an accident. The test fails to assess ability to transfer, endurance, and characteristics of simple gait, such as walking speed. This measure should be used in conjunction with other measures such as the 10-meter walk test, 2-minute walk test, and the timed up and go to provide a more comprehensive assessment of a patient.

Documentation in Clinical Notes

When assessed with the four square step test (FSST), the patient scored 20.5 s today. This shows an decrease/increase in time since last assessed on 99/99/9999 and represents and improvement/regression in the patient’s dynamic stability and ability to step over small objects forward, laterally, and backward.

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Disclaimer: The Authors, the Outcomes Research Committee, and the American Academy of Orthotists and Prosthetists does not endorse the use of any single outcome measure over any other single outcome measure and declares no conflict of interest in the presentation of this measure. There may be multiple versions of the instructions published in research literature. This reference guide has attempted to remain consistent with the instructions from the original developers of the outcome measure wherever possible, however in some instances one version of the instructions was chosen for ease of use in the clinic.

References


• Figure 2. http://ci-journal.net/index.php/ciej/article/viewFile/767/901/4934