Predicting Which Older Adults Will or Will Not Fall Using the 30-Second Chair Stand Test

Debra J. Rose, PhD and Danielle Hernandez, MS
California State University, Fullerton

Introduction

The 36-Second Chair Stand (CS) test was originally developed as a measure of lower body strength. The CS test is not an assessment item from the battery of functional fitness assessments known as the Senior Fitness Test developed by the California State University, Fullerton. This test involves lifting oneself up 8 times continuously from a chair within a 30-second time interval. The purpose of the CS test is to assess lower body strength in functional fitness assessments known as the Senior Fitness Test developed by Rikli and Jones. The test developers also established a criterion reference point for the CS test predictive of faller status. The participant is instructed to sit in the middle of the chair, back straight, and held against the chest. On the signal “go” the participant rises a distance of 200 feet, and not diagnosed with a progressive neurological condition or severe musculoskeletal condition. All participants completed a fall screening session at a location within the community. During the initial screening, participants completed several physical performance tests (i.e., Fullerton Advanced Balance scale, 30-foot walk at preferred and maximum speed, 8 Foot Up and Go test, 30-second arm curl, and CS test). Only CS test data were used for the purpose of this study. Important demographic information was determined and each participant (i.e., history of no fall in the previous 12 months) and faller (i.e., history of one or more falls in the previous 24 months). The HAQ provided information related to self-perceived functional ability (using the Composite Physical Function (CPF) scale) as well as a retrospective fall history report (based on history of falls in the previous 12 months).

Statistical Analyses

These statistical procedures were used to investigate the predictive properties of the CS test relative to faller status. First, binary logistic regression was used to develop a predictive model. The dependent variable was faller status (1 = falls in the previous 12 months; 0 = no fall in the previous 12 months). The independent variable was the total number of chair stands. The CS test was chosen as a measure of lower body strength, which, although important, is only one physical risk factor associated with fall risk. Other tests that address multiple dimensions (e.g., static and dynamic balance, gait, and gait of balance and mobility, such as the 8-Foot Up & Go test) have demonstrated better sensitivity and specificity in predicting faller status. Specifiy, Rose, Jones, & Lucchese demonstrated the sensitivity and specificity of 86% and 84% for predicting faller status using the 8-Foot Up & Go test. Although the optimal cut-off point of less than 11 chair stands was a moderately good predictor of faller status (80% precision/10 correctly identified) it was quite poor in predicting non-faller status (54%). Conversely, at the current center point of less than 8 chair stands, the CS demonstrated improved sensitivity and specificity (94% sensitivity, 94% specificity) in predicting non-faller status (3.6/10) but considerably better predictive validity relative to other tests. Based on the results of this study, it is not recommended that practitioners use the criterion reference point of less than 8 chair stands to signify of less severe musculoskeletal or functional independence as an indication of heightened fall risk.

Results

Linear logistic regression analysis indicated that the CS test could be used to predict faller status (OR = 32.83, p < 0.001). In the present sample, using a cut-off point of below 8 chair stands, Receiver Operating Characteristic (ROC) analysis produced a sensitivity of 35.7% and specificity of 83.5% in predicting faller status. The ROC analysis demonstrated that optimal sensitivity and specificity was produced when using a cut-off point of below 11 chair stands, which produced a sensitivity of 68% and specificity of 54%.

Conclusions

Although the CS test is a simple and convenient test, practitioners should recognize that the test was designed to assess lower body strength which, although important, is only one physical risk factor associated with fall risk. Other tests that address multiple dimensions (e.g., static and dynamic balance, gait, and gait of balance and mobility, such as the 8-Foot Up & Go test) have demonstrated better sensitivity and specificity in predicting faller status. Specifiy, Rose, Jones, & Lucchese demonstrated the sensitivity and specificity of 86% and 84% for predicting faller status using the 8-Foot Up & Go test. Although the optimal cut-off point of less than 11 chair stands was a moderately good predictor of faller status (80% precision/10 correctly identified) it was quite poor in predicting non-faller status (54%). Conversely, at the current center point of less than 8 chair stands, the CS demonstrated improved sensitivity and specificity (94% sensitivity, 94% specificity) in predicting non-faller status (3.6/10) but considerably better predictive validity relative to other tests. Based on the results of this study, it is not recommended that practitioners use the criterion reference point of less than 8 chair stands to signify of less severe musculoskeletal or functional independence as an indication of heightened fall risk.

References