

Review article on performance-based measures for gait (walk test) assessment in knee osteoarthritis Patients

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Abstract:

Knee osteoarthritis (OA) is the most common joint disorder in the united states. Millions of patients suffer from joint diseases around the world in which osteoarthritis is one of the most common form of arthritis which affect synovial joints. Osteoarthritis has a great impact on the individual's quality of life. Osteoarthritis is one of the leading causes of disability and the common risk factors in patient with knee osteoarthritis are age, weight, trauma to joint due to repetitive movements in particular squatting and kneeling. Physical function is related to “the ability to move around” and “the ability to perform daily activities” and can be classified as Activities using the World Health Organization International Classification of Functioning, Disability and Health (ICF) model.

Key words: Knee, Osteoarthritis, Gait, physiotherapy

INTRODUCTION:

Knee osteoarthritis (OA) is the most common joint disorder in the united states.¹ Millions of patients suffer from joint diseases around the world in which osteoarthritis is one of the most common form of arthritis which affect synovial joints.² Osteoarthritis has a great impact on the individual's quality of life.³ Osteoarthritis is one of the leading causes of disability and the common risk factors in patient with knee osteoarthritis are age, weight, trauma to joint due to repetitive movements in particular squatting and kneeling.⁴

The prevalence of symptomatic knee OA in adults 60 years or older is approximately 10% in men and 13% in women. The people affected with symptomatic knee OA is on an increase due to the aging of the population and the rate of obesity or overweight in the general population. During a one year period, 25% of people over 55 years may have persistent episode of knee pain, and about 10% of people aged over 55 years have painful disabling knee OA of whom one quarter are severely disabled. The incidence of knee OA in males aged <55 years was lower than females and the females, particularly those ≥ 55 years, tends to have more severe knee osteoarthritis.⁴

Gait pattern of the Patients with knee Osteoarthritis are affected as the disease progress. Patients with knee osteoarthritis develop their own gait pattern and try to unload the affected structure during their gait. More over gait pattern of the patients differ between the patients having less severe knee osteoarthritis and more severe osteoarthritis. When a person is walking the body should bear weight, provide support for locomotion and maintain equilibrium to achieve that gait pattern. To maintain the mobility the patient strive to retain their ability even in the presence of severe impairment like in osteoarthritis condition.³ As from previous study it shows that gait adaptations in people with knee OA including reduced walking speeds and knee flexion during weight acceptance and reduced overall range of motion at the knee joint.¹

Performance-based measures are defined as assessor-observed measures of tasks and usually assessed by timing, counting, or distance methods.⁵ The tests includes 30-s chair-stand test, 40 m fast-paced walk test, a stair climbing test, timed up-and-go test and 6-min walk test.⁶

30-s Chair-Stand test is used to assess functional mobility and strength. In this test from the sitting position, the participant stands up completely up so hips and knees are fully extended,

then completely back down, so that the bottom fully touches the seat. This is repeated for 30 seconds and then the same chair should be used for re-testing within site. If the person cannot stand even once then allow the hands to be placed on their legs or use their regular mobility aid. This is then scored as an adapted test score.⁷

40m (4x10m) Fast Paced Walk test is used to assess the functional mobility and gait. In this test Participants are asked to walk as quickly but as safely as possible, without running, along a 10 m (33 ft) walkway and then turn around a cone, return then repeat again for a total distance of 40 m (132 ft) (3 turns).Regular walking aid is allowed and recorded.⁷

Stair Climb Test (SCT) is used to assess functional strength and balance. In this test ascend and descend of stairs as quickly as possible are done in a safe manner. Use of a handrail and walking aid is permitted if needed. Use should be recorded. Same stairs should be used for re-testing within site.⁷

Timed Up and Go Test is used to assess functional mobility and gait. In this test Participants are asked to stand up, walk to a mark 3m (9.8 ft) away, turn around and return to sit back in the chair at their regular pace. Regular walking aid is allowed and recorded. Same chair is needed for re-testing.⁷

Six Minute Walk Test is used to assess the aerobic capacity and gait. The aim of this test is to walk as quickly as possible for six minutes to cover as much ground as possible. Rest periods are allowed but included in the time (i.e. time is not stopped for resting). Encouragement (e.g. “keep going you are doing really well”) is given at minute intervals. Same course should be used for re-testing within site.⁷

Two minute walk test can be used to assess the functional mobility and gait. In this test the Subjects would asked to walk as far as they could in 2 minutes without further encouragement. The test administrator walked behind the participant to minimize pacing, and participants were provided with clear instructions. Participants walked at a comfortable speed between 2 cones that were 30 m apart. They were permitted to slow down, stop, and rest as necessary during the 2-minute walk. Subjects were permitted to use their habitual assistive devices.⁵ As it reviews from the previously study shows that two minute walk test used in the population of COPD, lower extremity amputation, multiple sclerosis, neurological impairment(stroke, head injury, and

tumor), older adults or geriatric and spinal cord injury in order to assess functional mobility and gait.

Need of Performance based measures:

Performance-based measures assess what an individual can do rather than what the individual perceives they can do, which is determined by self-report measures. Increasing evidence suggests that performance-based measures capture a different construct of function and are more likely to fully characterize a change in body function than self-reported measures alone. Both types of measures are now seen as complementary rather than competing when evaluating functional outcomes in people with OA.⁸

Quality of outcome measure:

Reliability: - Criterion is said to be reliable if it is stable or reproducible. In our study two type of reliability was calculated; relative reliability and absolute reliability. Relative reliability was calculated with ICC. Test retest reliability was calculated by using Inter-class correlation 3,1(2-way mixed effect and consistency). ICC value > 0.50 are considered poor, if it is between 0.51 to 0.75 they are considered moderate, and < 0.75 they are considered good. Absolute reliability is the amount of disparity between the score obtained from the repeated measurement. Standard error of measurement is comes under the absolute reliability. SEM is used to establish the true scores or to find out amount of changes can come in the scores with repeated measurement⁹

Internal consistency: - Internal consistency was computed with Cronbach's alpha that determines the similarity of the scale component. Homogeneity refers to unidimensionality. Minimum value of alpha is 0.90 and desirable value is $\alpha = 0.95$ ¹⁰

Concurrent Validity: - It is a part of the criterion validity that can be calculated by comparing a scale with the gold standard measurement which act as an basis for checking the likeness. If a scale is established with high concurrent validity than it shows that score on the questionnaires are linked to other measure used.¹¹

ROLE OF MDC IN OUTCOME MEASURES:

Minimal detectable change (MDC) is defined as the minimal amount of change that is not due to variation in measurement and it also gave clinical meaningfulness. MDC scores can interpret the minimal change that is not due to error. MDC gives scoring on the basis of patient performance due to improvement in condition not because of any measurement error. We can determine the clinical significance of a particular intervention in rehabilitation programs by calculating MDC on the basis of pre and post intervention assessment. Once the MDC is determined on the particular test for a given population, therapist can interpret whether the change score for the patients is at or above the minimal level of detectable change. If the patients score is less than the MDC value it is considered to be indistinguishable from measurement error.¹²

IMPORTANCE OF TEST- RETEST RELIABILITY:

Test-retest reliability is the most common measure of reliability which obtained by administering the same test twice over a period of time to a group of individuals. Method of calculating test retest reliability is by giving the same test to the same test respondents on two separate occasions. We can refer first administration reading as T1 and second administration reading as T2. The scores on the two occasions are then correlated.¹³

REVIEW OF LITERATURE:

- Jayalath J.L.R.et al conducted study on gait variation in patients with knee osteoarthritis. In this study total number of participants were 120.The participants were divided into 2 groups,i.e. osteoarthritis and control group and at the end concluded that osteoarthritis shows different patterns of affection in gait between genders.³
- Ertugrul Yuksel, MSc et al conducted study on assessing minimal detectable changes and test-retest reliability of the timed up and go test and the 2-minute walk test in patients with total knee arthroplasty.In this study total number of participants were 48 and in this study they state that two minute walk test and tug test are reliable and valid tests in many patients group.⁵
- Erika O. Huber et al Conducted study on Construct validity of change scores of the Chair Stand Test versus Timed Up and Go Test, KOOS questionnaire and the isometric muscle strength test in patients with severe knee osteoarthritis undergoing total knee

replacement. In this study it shown that tug is previously done in osteoarthritis patients and the mean time required for the subjects with knee OA (mean age 69 years) 9.8sec.¹⁴

- Ertugrul Yuksel, MSc et al conducted study on assessing minimal detectable changes and test-retest reliability of the timed up and go test and the 2-minute walk test in patients with total knee arthroplasty. In this study 48 patients with total knee arthroplasty operated by same surgeon were included in this study and at the end concluded that the tug and 2minute walk test have an excellent test-retest reliability in patients with TKA.⁵
- Jessyca PR Selman et al conducted study on reference equation for the 2-Minute Walk test in adults and the elderly. In this study total number of participants were 390 and at the end concluded that established a prediction equation that may be used as a reference to interpret performance on the 2minute walk test of adults and the elderly with different health conditions.¹⁵
- Dina Brooks, PhD et al conducted study on validity of 3 physical performance measures in inpatient geriatric rehabilitation. In this study 52 subjects were taken and at the end concluded that the tug test and 2 minute walk test are valid and responsive outcome measures in older persons participating in geriatric rehabilitation.¹⁶
- Linda Kahr Andersen, PT,MSc et al conducted study on two- and 6-minute walk tests assess walking capability equally in neuromuscular diseases. In this study total number of patients with neuromuscular diseases were 115 and are invited to participate on 2 test days, each consisting of 1 2MWT and 1 6MWT separated by a minimum 30-minute period of rest and at the end concluded that the 2 minute walk test is a potential alternative to the 6MWT to describe walking capability among patients with neuromuscular diseases during clinical trials.¹⁷
- Ahmad Alghadir et al conducted study on the reliability and minimal detectable change of timed up and go test in individuals with grade 1–3 knee osteoarthritis. In this study total number of participants were 65 and concluded that the tug is a reliable test with adequate MDC for clinical use in individuals with doubtful to moderate knee OA.¹⁸

Conclusion/ Discussion:

With the help of this study reviewer will come to know about different outcome measures that are performance based and specifically for walk test. With these scales, gait impairments could be assessed along with differentiation of those impairments which can be due to gait deviations. Furthermore, they will come to know about how to assess the quality of outcome measure and individualize the treatment plans based on functional limitations in daily clinical set up for better management and enhancing the effectiveness of physiotherapy rehabilitation.

Further good quality research investigating measurement properties of performance measures, including responsiveness and interpretability in people with hip and/or knee OA, is needed. Consensus on which combination of measures will best assess physical function in people with knee OA is urgently required.

Conflict of interest:

This study does not have any conflict of interest.

Source of funding- Self

Ethical clearance- Secondary published data has been used, Not applicable because no experimentation done on patients.

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