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RELIABILITY ASSESSMENT: (SAPLT) KNEE TEST

The sitting active and prone passive lag test: An inter-rater reliability study

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Summary *Background & purpose:* To determine inter-rater reliability in identifying a knee extension lag using the sitting active and prone passive lag test (SAPLT).
Methods: 56 patients with a diagnosis of knee pain were randomly assigned and independently examined by two physical therapists at a time, to determine the presence of an active or a passive extension lag at the knee. An active lag was determined by the inability of the erectly seated subject to actively extend the involved knee in maximal dorsiflexion of the ankle to the same level as the normal knee held in maximal extension and ankle in maximal dorsiflexion, as seen by the levels of the toes. A passive lag was determined by placing the subject prone with the knees just past the edge of the table and determining the high position of the heel in a fully resting extension position compared to the heel on the normal side.
Results: For the sitting active lag test, the inter-rater reliability was 'good' (Kappa 0.792, SE of kappa 0.115, 95% confidence interval). For the prone passive lag test, the inter-rater reliability was 'good' (Kappa 0.636, SE of kappa 0.136, 95% confidence interval).
Conclusion: The SAPLT may be incorporated as a simple yet effective test to determine the presence of a knee extension lag. It identifies the type of restraint, active, passive or both, and is suggestive of the most appropriate management.

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Introduction

The lack of terminal extension and its consequences in the knee have been previously described (Rice et al., 2011; Stillman, 2004; Shea et al., 2012; Adernito et al., 2005; Temelli and Akalan, 2009). The terms flexion deformity or flexion contracture have been used and their occurrence has been mostly associated with post operative knee surgery and osteoarthritis (Koh et al., 2012; Onodera et al., 2012). Additional causes described are arthrogenic muscle inhibition (AMI) (Rice and McNair, 2010), secondary to trauma to the knee, gastrocnemius and hamstring tightness (Nyland et al., 2005; Chimera et al., 2012; Gupta et al., 2012) and injury to the knee extensor mechanism (Brooks, 2009). Terminal extension in the knee is a pre-requisite for adequate stability and load distribution during the stance phase of gait and weight bearing function (Jefferson et al., 1990). The lack of full extension at the knee results in greater force of quadriceps activation and energy expenditure. It also results in slower walking velocity and abnormal gait mechanics, overloading the ipsilateral (Hotfiel et al., 2012) and contralateral joints, resulting in pain and dysfunction (Rice et al., 2011; Vince et al., 2005; Gurney, 2002; Zalta, 2008). Residual knee flexion contractures have been associated with poorer functional scores and outcomes (Goudie et al., 2011; Su 2012). While some flexion contractures are obvious others can be subtle and missed. Additionally it may not be a contracture but a diminished efficiency of the knee extensor mechanism. They may still result in a lack or lag of terminal knee extension, with instability and consequences therein. This simply means that a lack in terminal knee extension may be a problem of either an active or a passive restraint. Since the presence and consequences of a lack of terminal extension at the knee have been described, the need for a reliable test to appropriately identify its presence is obvious. A detailed literature search revealed one test that addressed this need (Stillman, 2004). It recommends the supine position with ankles on a roll and knees unsupported to look for a quick visual comparison of passive knee extension between sides, for the passive part of the test. This method, although a good screen, may miss small degrees of a passive extension lag which may still be clinically consequential. The supine position with a roll under the knees and patient performing the typical terminal knee extension is described for the active component of the test. This, despite excluding the influence of the hamstrings may be strongly influenced by the ankle position, dorsiflexion or plantarflexion, as a tight gastrocsoleus has a definite influence on terminal extension. Moreover, excluding the hamstrings simply negates a passive restraint, another treatable cause for a lack of terminal knee extension. Interestingly, this study had no mention on the reliability of the testing method, rather the aim of the study was to alert the reader to quadriceps lag in normal knees, and to examine how the method of testing, and in particular the duration of any sustained active muscle contraction, can affect the magnitude of quadriceps muscle lag. Moreover the focus of the study was restricted to the active restraint, the quadriceps with no premise for the passive restraints as causative factors for a knee extension lag.

Current evidence based practice suggests clinical tests to have 'diagnostic utility' prior to administration in clinical practice (Tweed and Wilkinson, 2012). It suggests that a clinical test should first have an operant definition based on it's clinical need and be reliably reproducible between examiners. Subsequently, the sensitivity, specificity, likelihood and odds ratios are calculated. It is obvious that when an operant definition of a clinical test has been established based on the clinical need, studying it's reliability would be an essential precedent.

In the presence of a knee extension lag, ideally the test should identify both a passive and an active restraint, as it may suggest the type of intervention needed. The SAPLT aims to be able to identify both active and passive restraints to a lack of terminal extension. As it has not been previously described, the aim of this study was to identify an operant definition for the sitting active and prone passive lag test (SAPLT). Subsequently the intent was to introduce it to clinicians of varying experience levels and finally test the reproducibility of the test between raters.

Methods

As the SAPLT has not been described in the past a gold standard is unavailable. Hence, two orthopaedic board certified and orthopaedic manual therapy fellowship trained physical therapists, with 22 years of experience in orthopaedic physical therapy, conducted a self pilot training on unilaterally symptomatic knees. The intention was to first familiarize the methodology of performing the SAPLT and subsequently establish an operant definition. An active lag was determined by the inability of the erectly seated subject to actively extend the involved knee, with the ankle in maximum dorsiflexion, to the same level as the normal knee held in a full knee extension and ankle dorsiflexion (Fig. 1). This was determined by the low position of the toes on the involved side (Fig. 2). A passive lag was determined by placing the subject prone with the knees just past the edge of the table (Fig. 3). With both legs fully extended and resting the high position of the heel compared to the heel on the normal side determined the presence of a passive lag. (Fig. 4) The differentiation between an active and a passive lag is mandatory as, when appropriately identified, the most appropriate management can be instituted. An active lag

Figure 1 Test position for 'Active lag'.