**The Mobil-Aider™: Taking the Guessing out of Anterior Cruciate Ligament Testing**

**White Paper**

**Dr. Dawn T. Gulick, PhD, PT, AT, CSCS**  
Founder & CEO, Therapeutic Articulations, LLC

**Background:** Knee disorders prevalence is estimated at more than 50% in a lifetime.\(^5\) Given an estimate of over 250,000 anterior cruciate ligament (ACL) injuries per year in the USA,\(^15\) an instrument to quantify the linear translation of this ligament would be very valuable.\(^16,19\)

**The Problem:** The ACL is assessed via 1 of 3 widely accepted clinical tests: anterior drawer, Lachman, and pivot-shift.\(^5,10,22-24,26,29\) These tests involve linear translation of the tibia on the femur. Meta-analysis and systematic reviews reported these 3 tests have a wide range of diagnostic accuracy.\(^20,28\) Individual modifications of the tests and examiner experience have been reported to influence test accuracy.\(^7,16\) Nonetheless, the Lachman test (Figure 1) is considered the gold standard.\(^29\) It is performed in the supine position with the knee in 20-30° of flexion. Test results are dichotomous: positive if the ligament is torn and negative if it is intact.\(^16\) But what if the ligament is partially torn or intact but stretched? One study found the misdiagnosis of acute ACL injuries by emergency room physicians to be 74%.\(^12\) There are many reasons for this statistic. When there is a mismatch between the girth of the patient’s leg and the size of the clinician’s hand, it can be very challenging to perform a Lachman’s test. If the patient’s knee is in too much flexion or if the hamstring musculature is not relaxed, false negative results may be obtained. Finally, asymmetry greater than 3-5 mm in side-to-side laxity or a soft endpoint is considered abnormal. Even for the most experienced clinician, a criterion of 3 mm is extremely challenging to quantify by “feel.”

Magnetic resonance imaging (MRI) is often used for ACL injury diagnosis.\(^15\) However, an MRI is a static image and is best used in conjunction with instrumented laxity devices to assess biomechanical behavior.\(^8\) Furthermore, the ability of MRI to identify partial ACL tears has been
called into question. Over the past three decades, there have been a few instruments reported to be able to assess ACL laxity. However, all of the devices have been met with challenges. The Hall Effect Strain Transducer (HEST) was implantable. The Rottometer was a computer-assisted goniometer used to measure rotation of the tibial axis. The Vermont knee laxity device was very bulky and required a significant amount of time to utilize. The Lars rotational laxiometer was dependent on too many variables. The Kinematic Rapid Assessment (KiRA) requires Bluetooth technology to measure acceleration of the tibia on the femur. The Telos is used in conjunction with radiographs. The Vernier Dial Test Indicator has not been validated. The Telos, GNRB, and KT1000/2000 require considerable set up time and do not involve direct clinician contact with the patient. The Telos is used in conjunction with radiographs. The GNRB sells for $13,800 and the KT1000/2000 is no longer being produced (only available through the re-sale market). Several studies have reported substantial variability in the measures using the KT1000/2000, as high as a 28% false-negative rate. Despite these drawbacks, the KT1000/2000 device did sell because it met an unfulfilled need. Several studies have reported substantial variability in the measures. Despite these drawbacks, the KT1000/2000 device did sell because it met an unfulfilled need.

**Response to the Need:** The Mobil-Aider™ is innovative technology (Figures 2 & 3). It permits the clinician to interface the device between the patient’s skin and the clinician’s hands so there is no need to deviate from the standardized Lachman technique. In fact, the Mobil-Aider™ can even be used to perform a prone Lachman test. The contour of the device conveniently puts the knee in the optimal 20-30 degree knee flexion position. Aside from knowing which attachment to use for each technique, no additional training is needed to quantify the linear translation of tibia on the femur. The clinician gets a quantified, digital read-out and can also appreciate the
qualitative endfeel of the technique. In addition, recent bench testing reported excellent Pearson correlation coefficients (>0.989), high reliability (Cronbach Alpha > 0.992), and numerous other statistics to support the concurrent validity and reliability of the device.

So who should use the Mobil-Aider™? There are a variety of clinicians in both the human and veterinary worlds who could capitalize of the technology of this device. The Mobil-Aider™ can be used as both a screening/examination tool as well as a treatment tool. The general practitioner, orthopedic surgeon, physician assistant, chiropractor, physical therapist, and athletic trainer could use the device to assess a patient with a potential knee cruciate ligament injury. In conjunction with imaging, the determination could be made to embark on a surgical repair or to manage the laxity with non-surgical, conservative intervention. The Mobil-Aider™ is portable and weighs less than one pound.

Therapeutic Articulations, LLC is the recipient of a phase 1 National Science Foundation Grant. The Mobil-Aider™ has received FDA approval and has a utility patent pending. The mission of the Mobil-Aider™ is to capitalize on technology to enhance the practice of orthopedics: “To Measure the Art of Medicine.”

References:

7. Draper DO, Schulthies SS. Examiner proficiency in performing the anterior drawer and Lachman tests. JOSPT. 1995;22(6):263-266


