

The Mobil-Aider™: Solving the Problem of Inconsistent Joint Mobilizations

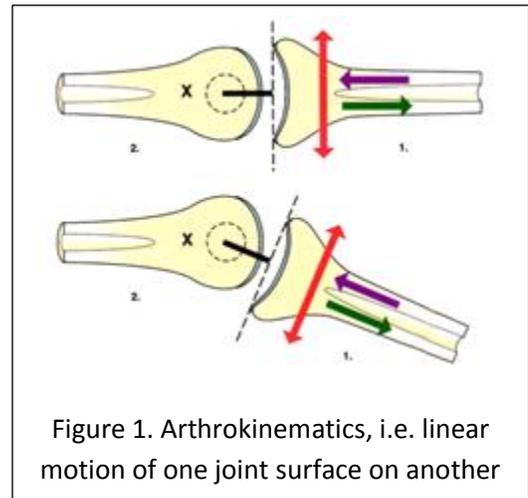
White Paper

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Background: Abnormal joint mobility is a component of movement dysfunction.¹⁷ Joint mobilization techniques aim to restore the accessory (arthrokinematic) movements between joint surfaces (Figure 1).² Joint mobilizations have been reported to influence a variety of joint structures.^{8,17}

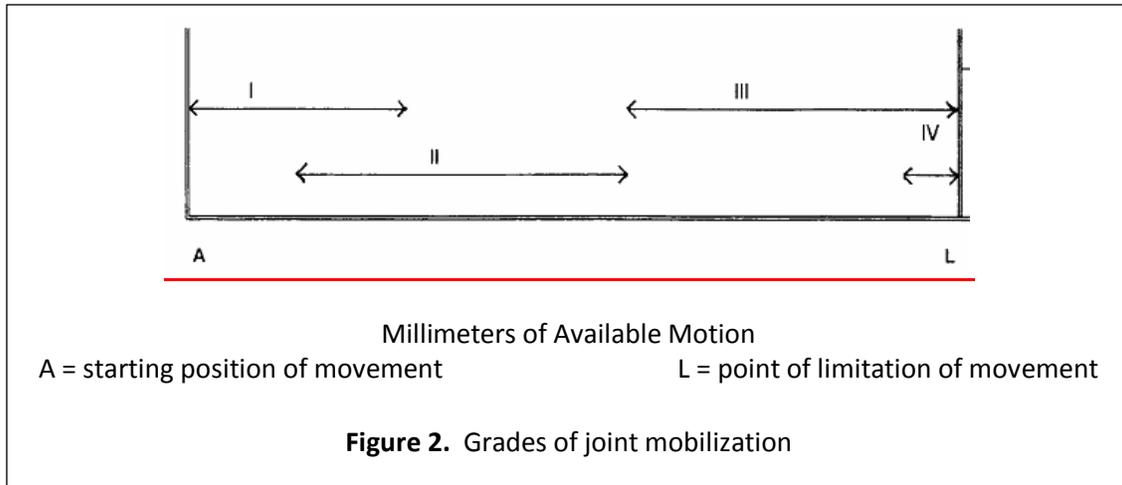
Neurophysiologic alteration in the cutaneous receptors, muscle spindles, and mechanoreceptor threshold has been reported to be an explanation for decreased pain, increased mobility, and increased strength after joint mobilization.^{4, 8,17} Likewise, physical loading and unloading of joint cartilage may facilitate the flow of synovial fluid within the joint to enhance nutrition to the articular cartilage.¹²



Maitland⁷ described the passive, oscillatory, rhythmic movements to a joint by grades. There are four grades of mobilization (Figure 2):

- Grade I – small 1-2 mm amplitude motions in the first quarter (beginning) of the available joint translation
- Grade II – larger 2-4 mm amplitude motions in the first half of the available joint translation
- Grade III – larger 2-4 mm amplitude motions in the second half of available joint translation, into the end-range
- Grade IV – small 1-2 mm amplitude motions at the last quarter of the available joint translation, into the end-range

Grade I and II mobilizations are used to abate pain.^{7,8} Whereas, grade III and IV mobilizations are used to address tissue extensibility.^{7,8}



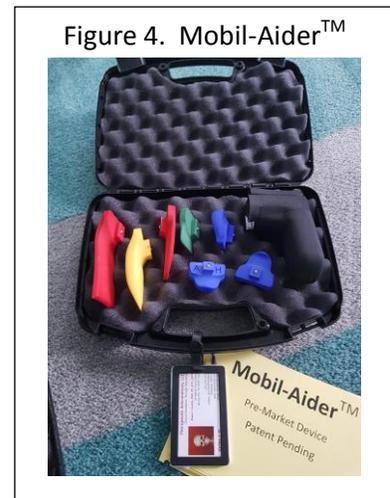
Problem: Studies have reported that skilled clinicians have good relative intra-clinician reliability, i.e. they could replicate their “force” application during joint mobilizations, but had poor to moderate reliability between clinicians.^{3,13} However, performing consistent joint mobilizations begin with the way the task is learned in the classroom. One can appreciate the cognitive elements of mobilization grades, but unless this knowledge is transitioned to the psychomotor skill in a clinical setting, it is of little use. Mastering a psychomotor skill requires purposeful practice with feedback,¹ specifically visual feedback.² Furthermore, concurrent feedback given while the learning task is in progress is critical.¹ Yet, the limited devices available for quantitative feedback are either too cumbersome^{6,9,15} or measure force.^{2,10,11,13,14} Force is not the operative measure. Studies have reported a poor correlation between force and displacement.^{2,16} In addition, displacement is influenced by the rate of force application.⁵

Solution: The Mobil-Aider™ is a transformative device designed to address the clinical issues of joint mobilization (Figure 3). The key innovation associated with the Mobil-Aider™ is the development of a device to quantify and compartmentalize the magnitude of joint translation. This light-weight, versatile, and cost-effective device uses LED feedback to provide real time quantification of the linear translation. The device design permits classic joint mobilization techniques to be used to minimize the learning curve. A variety of specifically



designed attachments permit the use of the device for the shoulder, elbow, wrist, knee, and ankle (figure 4). The quantified feedback increases the reproducibility of the intervention. Consistency will ensure the proper mobilization grade is administered and will enhance the patient outcome with regard to pain reduction and improved joint mobility.

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.”**



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