Dynamic Chiropractic

DIAGNOSIS & DIAGNOSTIC EQUIP

Chiropractic Muscle Testers Rise to the Challenge of Validating Their Work

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This article reviews a landmark study presenting the basic science and clinical research evidence for the reliability and validity of the manual muscle test (MMT). The study was published in March in the *Journal of Chiropractic and Osteopathy*.[1]

"On the Reliability and Validity of Manual Muscle Testing: A Literature Review" presents the results of more than 100 peer-reviewed studies related to the MMT and the applied kinesiology chiropractic technique (AKCT). Since the first peer-reviewed publication on the topic in 1915, the growth of knowledge about the MMT and the muscle system in general, has been exponential.

Founded by Dr. Goodheart (now in his 69th year of chiropractic practice), the International College of Applied Kinesiology (ICAK) has functioned within the chiropractic profession as a self-appointed Greek chorus commenting upon and participating in the action, as knowledge about MMT has developed. Since 1964, Dr. Goodheart and the ICAK have won over (in a census taken by the National Board of Chiropractic Examiners in 2000) 43.2 percent of the chiropractic profession who now use AK in their practices.[2-4] Similar numbers are reported in Australia.[5]

The role of the muscle system in spinal function has become increasingly well-acknowledged and MMT is the most commonly used method for documenting impairments in muscle strength. MMT is used by AK chiropractors to determine whether manipulable impairments to neurological function (controlling muscle function) exist. For example, chiropractic management using MMT for a patient with carpal tunnel syndrome may involve assessment of the opponens pollicis and flexor digiti minimi muscles (innervated by the median and radial nerves) and then adjustment as indicated to the carpal bones, radius and ulna; attention to an inhibited (on MMT) pronator teres muscle; adjustment of the cervical or thoracic spines; and evaluation of cranial nerve XI through MMT of the sternocleidomastoid and upper trapezius muscles. Any or all of these factors may require treatment in order to strengthen the inhibited opponens pollicis and flexor digiti minimi muscles, which are evidence of the carpal tunnel syndrome. This "continuous nervous system" thinking and testing in AK allows the identification of contributing sites to a pain state.

The expectation in a chiropractic setting is that the proper therapy immediately will improve muscle strength upon MMT taking the patient from "weak" to "strong." Chiropractic therapy can produce rapid responses for the innervation of muscles because the basic therapy required for chiropractic patients is decompression of the nervous system. This literature review, which evaluated randomized clinical trials (n=12), prospective cohort studies (n=26), retrospective studies (n=17), cross-sectional studies (n=26), case-control studies (n=10), and single-subject case series and case reports (n=19) from the PubMed and CINAHL (Cumulative Index to Nursing and Allied Health Literature) databases, suggests this can be done readily with chiropractic manipulative therapy (CMT).[6,37]

The Reliability of the MMT

One way researchers determine if a clinical test is consistent and repeatable over several trials is to analyze its reliability. The reliability of a diagnostic method is the consistency of that measurement when repeated. Depending on the type of measurement performed, different types of reliability coefficients can be calculated.

The inter-examiner reliability of the MMT was reviewed from 19 studies.[7-18] Levels of agreement attained were excellent, ranging from 82 percent to 97 percent agreement for inter-examiner reliability, and from 96 percent to 98 percent for test-retest reliability. Despite this evidence, critics who remain unaware of the research literature underlying the MMT still assert that the method is unreliable. However this review of the scientific literature on MMT shows that this contention should be dismissed.

The Validity of the MMT

Validity is defined as the degree to which a meaningful interpretation can be inferred from a measurement or test. Validity refers to the appropriateness, truthfulness, authenticity or effectiveness of an observation or measurement.

The validity of Lovett's original MMT methods was based on the theoretical construct that properly innervated muscles could generate greater tension than the partially innervated muscles present in patients with anterior horn cell damage. Lovett (1915)[19,20] developed MMT as a method to determine muscle weakness in polio patients with damage to anterior horn cells in the spinal cord. The next development of the MMT was the measurement of physical weakness from faulty and painful postural conditions, injuries and congenital deformities.[21-23,25] The neurologists also adopted MMT as part of their physical diagnostic skills.[27] Then the chiropractic use of MMT began with AK in order to diagnose structural, chemical and mental dysfunctions.[24] The concept of manually examining the nervous system's status through MMT continues to evolve and gain adherents to this method.[2-4,28]

AK extends Lovett's construct and suggests that physical, chemical and mental/emotional disturbances are associated with secondary muscle dysfunction affecting the anterior horn of the spinal cord - specifically producing a muscle inhibition often followed by overfacilitation of an opposing muscle and producing postural distortions in patients.

Contrary to the physiotherapeutic understanding of the time, Goodheart suggested that muscle spasm was not the major initiator of structural imbalance.[24,29-30] The primary cause of structural imbalance is muscle weakness. Muscle weakness (as observed by MMT) is understood as an inhibition of motor neurons located in the spinal cord's anterior horn motor neuron pool.[31]

Chiropractic AK research also has suggested that there are five factors or systems to consider in the evaluation and effective treatment of muscle dysfunction: the nervous system, the lymphatic system, the blood vascular system, cerebrospinal fluid flow and the meridian system.[29,30] A complication to the original construct of MMT from Lovett and others has emerged with the increasing awareness that the responses to the MMT are not solely due to the denervation effects on neural tissues in conditions like polio, but also co-existing inputs to the spinal cord's anterior horn and the processing state of the CNS.[31]

Lamb stated (1985) that MMT has content validity because the test construction is based on known

physiologic, anatomic and kinesiologic principles.[32] A number of research papers have dealt with this specific aspect of MMT in the diagnosis of patients.[33,34]

In a paper by Panjabi, the world's most published biomechanical researcher, it is proposed that the function of muscles, as both a cause and a consequence of mechanoreceptor dysfunction in chronic back pain patients, should be placed at the center of a sequence of events that ultimately results in back pain.[35] This paper argues that as a result of spinal subluxations, muscle coordination and individual muscle-force characteristics are disrupted, i.e., inhibited muscles on MMT. The injured mechanoreceptors generate corrupted transducer signals which lead to corrupted muscle-response patterns (that research suggests may be detected by MMT, EMG and dynamometers).

This article is important for those in the manipulative professions who are evaluating the consequences of spinal dysfunction. The key technical factor in this hypothesis would be the MMT that makes the detection of the muscular imbalances producing the spinal dysfunction cited by Panjabi identifiable. Another paper by Hodges, et al. (2003) also suggests this hypothesis.[36] Pickar also has shown there is a substantial experimental body of evidence indicating that spinal manipulation impacts primary afferent neurons from paraspinal tissues, immediately affecting the motor-control system.[37]

In a previous literature review, Lund, et al. (1991)[38] describes muscle function in five chronic musculoskeletal pain conditions (temporomandibular disorders, muscle tension headache, fibromyalgia, chronic lower back pain and post-exercise muscle soreness). That review concludes that the data did not support the commonly held view that some form of tonic muscular hyperactivity maintains the pain of these conditions. Instead, they maintain that in these conditions, the activity of agonist muscles often is reduced by pain even if this does not arise from the muscle itself.

Lund's paper describes with fascinating similarity one of the major hypotheses in MMT and chiropractic, namely that physical imbalances produce secondary muscle dysfunction, specifically a muscle inhibition (usually followed by overfacilitation of an opposing muscle). A paper by Falla, et al. (2004) describes a similar model but involving patients with chronic neck pain.[39] A paper by Mellor, et al. (2005) presents this model in relationship to anterior knee pain[40] and Cowan, et al. (2004) in relationship to chronic groin pain with another paper demonstrating this mechanism in patellofemoral pain syndrome.[41,42] A review of 13 papers showed that patients with low back pain have lower mean trunk strength than asymptomatic subjects.[43-55]

Convergent validity exists when a test, as predicted, demonstrates a strong correlation between two variables. Discriminant validity exists when the test, as predicted, demonstrates a low correlation between two variables. These tests, when found to have the proper correlations, lend support to the construct validity of the method of testing. The convergent and discriminant validity of MMT was good to excellent in 35 studies that were reviewed. These studies examined the relationship between MMT findings in patients with and without neurological, musculoskeletal or viscerosomatic symptoms.

The concurrent validity of MMT was reviewed from 12 studies comparing strength scores obtained with MMT with strength readings obtained with quantitative instruments. The 12 studies showed the concurrent reliability of MMT to be excellent. Nineteen published peer-reviewed case reports (with patient cohorts ranging from 1 to 88 patients in the trials) using AKCT have been published

and were reviewed.[56-74]

To provide the strongest evidence for the use of chiropractic MMT techniques, more randomized controlled clinical trials (RCTs) and systematic reviews like this one in the *Journal of Chiropractic and Osteopathy*will be essential. However, because the etiology of a muscle weakness can be multifactorial, and because these multiple factors may be required in successful therapy, RCTs that employ only one mode of therapy to only one area of the body may produce outcomes that are poor due to these limitations. This is frustrating because it is the clinician who depends on scientific proof that these techniques work.

Although RCTs will be required to document a cause-effect relationship between treatment and outcome, they frequently are impractical projects for the practicing clinician. One alternative is for groups such as ICAK and others who use MMT methods to organize and fund these RCTs. The ICAK USA currently is funding RCTs on MMT.

In conclusion, this paper demonstrates that good to excellent reliability and validity exist for the use of MMT for patients with neuromusculoskeletal dysfunction. The studies demonstrated good external and internal validity and the 12 randomized controlled trials (RCTs) on MMT showed that MMT findings are not dependent upon examiner bias.

In order to evaluate the effectiveness of MMT in the diagnosis of patients with musculoskeletal and nervous system disorders, it is necessary to survey the full range of research studies that have addressed the topic, giving due consideration to the strengths and weaknesses of the studies in the literature. After such a review critics of chiropractic MMT and of AK in particular, should consider many of their critiques answered. Muscle testing, which is the backbone of AK, has good evidence to support its use in the field of chiropractic to diagnose and treat neuromusculoskeletal dysfunction.

Hopefully this presentation has stimulated a desire for others to review the current MMT literature and become effective users of and contributors to chiropractic MMT research.[1,75-76]

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