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This is a proposal of a possible description of the manual muscle testing methods used in the practice of Applied Kinesiology that attempts to satisfy all of the criteria considered important by the practitioners of this art and science that have published information on this topic. Please understand that this is open for revision with appropriate referenced suggestions.

I wish to express my appreciation for the help and suggestions given me by both David Walther and Katharine Conable over the many revisions of this document. I would also like to thank Hans Garten and Walter Schmitt for their input.
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Manual Muscle Testing as used in Applied Kinesiology practice

There are a number of descriptions of the basic manual muscle test in Applied Kinesiology. To get a description with a consensus would be have to be a description that lists all factors important to the professionals utilizing the technique. A descriptive test would appear to be the best solution. We should likely start with the two basic types of testing found in the neurology text by Chusid and Macdonald (1) 1967, and Chusid (2) 1985. The description is as follows: "Two techniques of testing may be used: active motion against the examiner's resistance and resistance against a movement performed by the examiner."

I will therefore call them

1. Examiner Started Manual Muscle Test – EsMMT
2. Patient Started Manual Muscle Test – PsMMT

The other type i.e. Schmitt's G-2 Submax test (4), is included as an addendum to the PsMMT. This is referred to as PsMMTsm.

EsMMT *(Examiner started manual muscle test) (Also known in the A.K. literature as Type 1, or G-1 Testing)* (4) (5) (6) (7) (10) (13) (15) (17) (22) (23) (31) (32)
This is a muscle test in which the examiner directs the patient to place the body or its parts in a position that isolates the muscle to be tested from its synergistic muscles to the greatest degree possible. The patient is then directed to hold the body part in that position without changing the position in any way. While the patient is holding the body part in that position, the examiner directs a gradually increasing force against the body part in a direction that lengthens the muscle separating origin from insertion or insertion from origin as is practical for the test. During this test the examiner senses the patient's ability to resist the test with a firm locking sensation. The examiner then increases the testing force slightly to determine if the locking sensation maintains, and if so the muscle test is considered as facilitated and or strong. If the patient's resistance cannot meet the examiner's increasing force and the tested muscle lengthens while the patient is actively contracting the tested muscle, (eccentric

according to additional criteria (see below). There are certain conditions that are considered important to this type of testing which are as follows:

Patient Conditions:

- The patient should maintain normal respiration unless he or she is asked to hold a phase of respiration by the examiner.
- The patient should be instructed to leave the teeth slightly separated with the temporomandibular muscles in a relaxed state unless specifically asked to contract them in a certain way as during a challenge test.
- The patient should resist the examiner's force with full effort.

Examiner Conditions:

- The examiner should gradually increase his or her testing force without the test duration exceeding 3 seconds. In most cases the test should be complete in 2 seconds or less to prevent a fatigue factor from influencing the test. The test should not be less than 1 second as there may not be enough time for the patient to prepare his musculature to resist the testing pressure.
- The examiner should be consistent in his or her testing procedures when the test is repeated on the same or other patients.
- The testing pressure should be with a soft contact not causing pain at the contact or stabilization point.

There are various criteria, regarding the current state of the tested muscle, which will be referred to as follows: Normally Facilitated Criteria (NFC), Hyperfacilitated Criteria (HFC), Functionally Inhibited Criteria (FIC) and Pathologically Weak Criteria (PWC). These are described in detail following the PsMMT *(Patient Started Manual Muscle Test)* below and apply equally to the EsMMT *(Examiner Started Manual Muscle Test)*. There are also additional factors that are important considerations for those using any type of manual muscle testing. These will be covered after the manual muscle test descriptions as <u>'Important Additional Factors that may influence the Accuracy of Any Manual Muscle Test'</u>. *These factors will be put after the descriptions, as many of these factors are important to all the types of accurate manual muscle testing*.

- Functional muscle inhibitions found by the manual muscle tests used in A.K. testing are graded as 4 or 3 on the traditional six level scale. Grades 2 and 1 are observed phenomenon rather than an actual test as described above. When muscles are pathologically weak (see below) they may be rated anywhere from grade 0 to 4. The full six level scale is given below.
- <u>Results of muscle testing</u>**:** *(The traditional scale of muscle test grading can be applied to the result of any type of muscle test* (5) (24) (25) 26) 27) 28)

  5. Normal, or full motion with full resistance
  4. Good, or full motion against gravity and some resistance
  3. Fair, or full motion against gravity only
  2. Poor, or full motion possible but only with gravity eliminated
  1. Trace, or evidence of contractility but no motion
  0. No contractility

PsMMT *(Patient started Manual Muscle Test) (Also known in the A.K. literature as Type 2, or G-2 testing)* (5) (6) (7) (8) (10) (11) (12) (13) (15) (22) (23) (25) (26) (28) (31) (32)

This is a muscle test in which the examiner directs the patient to place his or her body or its parts in a position that isolates the muscle to be tested from its synergistic muscles to the greatest degree possible. Contact is made by the examiner on the part to be tested in a manner, which is not painful to the patient. The patient is instructed to maximally contract the muscle in the vector that isolates the muscle, a vector that would approximate the origin and insertion or vice versa if the movement created was allowed to proceed without resistance. The examiner resists this increasing pressure, until the examiner can no longer sense an increase in pressure against his or her hand. At this point, the examiner adds an additional, slowly increasing vector of force that is directly opposite to the arc of motion of the body part that would be created by the muscle if no examiner resistance prevailed. If the patient's resistance cannot meet the examiner's increasing force and the tested muscle lengthens while the patient is actively contracting the tested muscle, (eccentric contraction), the muscle is considered to be Functionally Inhibited or Pathologically Weak according to additional criteria (see below). There are both patient and examiner conditions to be met for this test as listed below.

Patient Conditions:

- The patient should maintain normal respiration unless he or she is asked to hold a phase of respiration by the examiner.
- The patient should be instructed to leave the teeth slightly separated with the temporomandibular muscles in a relaxed state.
- The patient should exert his or her pressure against the examiner's stationary contact with as much force as he or she can muster in a controlled manner.

Examiner Conditions:

- The examiner should place the patient's body, or parts thereof to be tested in a position that maximally isolates the muscle to be tested.
- The examiner should demonstrate the tangent of the movement through which the patient is expected to move the body part so that the patient understands what is expected during the test.
- The patient's increase in force should not exceed 1.5 seconds and the examiners counterforce should not exceed an additional 1.5 seconds.

PsMMT (addendum)

PsMMTsm (Patient started sub-maximum Manual Muscle Test) (Also known in the AK literature as Type 3, or G-2s) (3) (7) (9) (5) (22) (31) (32)

Schmitt describes a test that he associates with the withdrawal reflexes following injury, allergy and hypersensitivity reactions, systemic functional endocrine imbalances, and visual motor problems such as functional problems with accommodation reflexes. In this test the patient and doctor are positioned to do the muscle test as above and the doctor instructs the patient to push against his testing hand. As soon as force is felt from the patient, the doctor applies his testing force. This is a concentric to eccentric patient contraction. This we can name PsMMTsm (*Patient started Manual Muscle Test submaximum).* The timing of the examiner's pressure is the only difference in this test. All other factors related to the PsMMT listed in this document apply to this form of testing as well.

Criteria Regarding the Current State of the Tested Muscle

If the tested muscle in either an EsMMT or a PsMMT does not give way or in fact overpowers the examiner, this is referred to as normally facilitated, or hyperfacilitated according to further criteria.

Normally Facilitated Criteria (NFC) (*Also known in the A.K. literature as normotonic, normoreactive, strong, or intact muscles)*

- A muscle that is normally facilitated will demonstrate inhibition when one of the following procedures is used to influence the muscle.Therapy localization to the sedation point or tapping of the sedation point of the ipsilateral associated meridian
- Manually running the examiners hand along the meridian in reverse.
- Digital pressure approximating the muscle spindles in the belly of the muscle involved.
- Placing either of the two poles of a strong axially polarized magnet (minimum 2000 gauss), centrally placed on the belly of the muscle.

Hyperfacilitated Criteria (HFC) (*Also known in the A.K. literature as hypertonic, hyper-reactive, frozen, or hyper muscles)* (6) (11) (12) (13) (23)

- A muscle that when tested is not inhibited by the NFC above.

If the tested muscle (either EsMTT or PsMTT) goes into eccentric contraction (lengthens while contracting), it is considered as either a Pathologically Weak or a Functionally Inhibited muscle, according to further criteria:

Pathologically Weak Criteria (PWC) A muscle is considered pathologically weak when its failure is due to pathological peripheral nerve injury, central nervous system injury or pathology, or local muscle injury.

The types of peripheral nerve injuries are as follows: (19) (30)

- Neurapraxia: Nerve injury (often times mechanical) of a minor degree involving only a temporary loss of conduction without loss of axon continuity. There is no Wallerian degeneration. The muscles affected by this will return to a facilitated strong state immediately upon the appropriate correction being made. This would cause a functional inhibition as described below under Functionally Inhibited Criteria.
- Axonotmesis: Nerve injury, which involves the axon and includes axonal disruption without loss of the neural connective tissue. This usually comes from stretch and crush injuries. This type of injury will experience Wallerian degeneration 12-48 hours post injury. In this type of injury, if the damaging condition is relieved a gradual return of function can be expected over a number of months as the nerves heal at a rate of 3-4 cm per month. This is considered a pathological injury.
- Neurotmesis: Nerve injury that is severe and involves loss of axon and neural connective tissue continuity. Severe crush, penetrating wounds, or rapid stretch/avulsion injuries cause it. Wallerian degeneration is present in these cases and they are surgical cases. This is considered a severe pathological injury.

Central nervous system problems
Examples of central nervous system pathology or injury are multiple sclerosis, spinal cord injury from trauma, or cord compression by tumor or other space-occupying lesion.

Muscle Injury
A muscle is also considered Pathologically Weak when it suffers from local pathology such as muscle strains of a severity to make the muscle unable to meet the demands of a manual muscle test. Such local pathology can include muscle tears, partial avulsions (not including microavulsions commonly treated with origin and insertion technique), and complete avulsions.

- Pathologically Weak muscles can be graded on the six level scale as grade 4 or lower (See the scale above)

Functionally Inhibited Criteria (FI-PsMMT-C or FI EsMTT-C) *(Also known in the A.K. literature as, functionally weak, weak, hypotonic, hyporeactive, conditionally inhibited, or non-intact muscle)*

- A muscle that cannot resist a manual muscle test, either EsMMT or PsMMT, without evidence of actual nerve interference of a pathological nature is considered to be Functionally Inhibited. *(Most muscles which cannot resist an A.K. muscle test are in the Functionally Inhibited category, either as a FI-EsMMT or a FI-PsMMT.)*
- Functionally inhibited muscles can be graded on the traditional six level scale as grade 4 and occasionally, grade 3. (See the scale above)

<u>Important Additional Factors that may Influence the Accuracy of Any Manual Muscle Test.</u>

- ✓ The patient's hands should be off his or her body so that random therapy localization is not done changing the test results.
- ✓ The patient's eye position during the test should be considered as this can influence the test. In some cases a challenge test can be with the eyes in a specific direction and can influence the test with either facilitation or inhibition.
- ✓ The examiner should observe the patient for the holding of a phase of respiration, which may influence the manual muscle test.
- ✓ The examiner should observe the patient for possible facial grimacing, clenching of the teeth or gum chewing, which may influence the manual muscle test. These actions should be avoided unless the examiner asks the patient to specifically contract certain stomatognathic muscles as a challenge test. . *(If gum chewing is noticed, the patient should be advised to avoid gum chewing before appointments.)* If the above are noticed, the patient should be advised to let the temporomandibular muscles to relax with the teeth slightly apart.
- ✓ In some cases where postural indications of possible inhibition are not borne out by the testing, having the patient take the tongue away from the roof of the mouth may make an underlying inhibition evident. (18)
- ✓ Adequate stabilization is important to accurate manual muscle testing so that the tested muscle can function from a stable base.
- ✓ The examiner should not contact the meridian pulse points on the wrists of a

demonstrate therapy localization before proceeding with the test. *(Therapy localization is covered elsewhere in the applied kinesiology literature)*

- ✓ The body position of the patient during the test, such as side bending and torsion, can influence the test. At times, the examiner may find useful clinical information by comparing the results of muscle testing in a neutral position with the results of other positions, such as weight bearing, and or habitual, slouched, or work postures.
- ✓ The examiner must develop timing consistency so that repeated tests are consistent.
- ✓ Although it has been mentioned before in this document, the timing of the test has been found on objective studies to be very important (20). Therefore, the test should not be of less duration than 1 second or more duration than 3 seconds. *Some researchers in Russia (38) on a small sample of 3 patients used prolonged muscle contraction increasing pressure every 3 seconds for a total of 9 seconds. They postulate different physiological mechanisms of support of prolonged muscle contraction. This is however a specialized case which does not represent the usual test done by the majority of those using manual muscle testing in Applied Kinesiology practice.*
- ✓ The evaluation of force produced by the patient is only one factor of accurate muscle testing. It is imperative that the examiner observes the changes the patient makes to change the parameters of the test. Changes the patient makes can be very subtle and easily missed, e.g. holding a phase of respiration. Often more information about the patient can be learned by these observations than from the actual muscle test.
- ✓ Any changes of parameters in the test have to be done in a controlled manner. This is called a diagnostic provocation or challenge. Structural, chemical, and or emotional challenges can be used. They may show a change in muscle function on a manual muscle test. These are described elsewhere in the applied kinesiology literature.
- ✓ Examiner prejudice should be avoided. Goodheart and others, have demonstrated that certain individuals are susceptible to the thought patterns of the examiner at the time of the manual muscle test. As this can influence the test findings, it is advised that the examiner keep his or her mind in a state of wonder as to what the outcome of the test will be during a manual muscle test rather than expecting the muscle to respond in a particular manner.
- ✓ Tonic labyrinthine reflexes, which relate to head position in relation to gravity, although not strong enough to cause a muscle to have a weak response to a manual muscle test, can have a facilitation or inhibition effect on the muscle being tested (22) (29) (32).
- ✓ Dehydration in some cases is a very important consideration especially if the majority of muscles tested appear to demonstrate inhibition and or weakness. In these cases, having the patient drink water will cause facilitation of many of the inhibited muscles resulting in clinical findings that follow a more understandable pattern.
- ✓ Darkness or artificial light during the test has been found to influence a manual muscle test in certain patients.
- ✓ Medications may interfere with accurate manual muscle testing. Special procedures may be necessary in these cases to get an accurate MMT.

- ✓ Electrical, magnetic, or other energy sources such as laser light, homeopathic remedies etc., can influence manual muscle tests if the body or parts thereof are directly subjected to these energy sources (12).

Other factors will in all probability be discovered that will increase this list and will likely be included at a future date.

Commentary:
It can be seen that there is much training necessary for an examiner to be an accurate - precise muscle tester. The EsMMT (Examiner Started Manual Muscle Test) is a very refined test, which requires much skill, accuracy and knowledge. It is a very sensitive test, which can be very useful and objective when used by a skilled examiner. However, because of the many influencing factors in this type of testing, it can become very subjective in the hands of an inexperienced and or biased examiner.
The Patient Started Manual Muscle Test PsMMt on the other hand does not require as much skill and can be easily done by an examiner with minimal training. Any studies of the manual muscle test that do not consider and apply criteria as listed above, without skill, accuracy and knowledge, cannot be considered as truly credible.

According to Dr. Schmitt, all muscle tests are in eccentric contraction. The differences exist in what pre-load activity takes place prior to the eccentric contraction. The EsMMT has no pre-load, the PsMMT has maximum concentric to isometric pre-load and the PsMMTsm has submaximal concentric pre-load. (32). He also points out that the *use* of the terms "hypertonic" and "hypotonic" as used in some AK literature is *inherently incorrect* as these terms are defined differently in the medical literature. (32)

The Neurological Model of the Manual Muscle Test (9) (10) (14) (16) (17) (21) (31) (32)

The current neurological explanation of a weak response to any muscle test is that the motor neuronal pool is biased too far towards hyperpolarization. This means that the central integrative state (CIS) of the alpha motorneurons (AMNs) of the involved muscle is inhibited. This state does not allow adequate muscle contraction resulting in the examiner's force taking the muscle into eccentric contraction (the muscle lengthening while still contracting).
A muscle is contractile tissue that is depolarized by an efferent signal from the motor neuron. Muscle testing is simply a test of the functional state or bias of the motor neuronal pool of the tested muscle. The weak response of the tested muscle should then be referred to as neurologically inhibited muscle. No matter what technique is used, whether it is acupuncture meridian stimulation, Chapman's reflex stimulation (also known as neurolymphatic technique), or osseous manipulation etc., if it returns the muscle to normal strength and function, it can be assumed that the technique has brought to anterior horn cells (both alpha and gamma motor neurons) associated with the muscle involved to a normal state of function.
Schmitt goes further to define a model for the various types of muscle testing

associated with local reflexes from mechanoreceptors mediated by the gamma motorneuron loop. He suggests that neurological factors affecting the dynamic (gamma 1 motorneuron system) originate at spinal levels (8). He associates the PsMMT weak response as being also mediated by the gamma motorneuron loop but that it is associated with suprasegmental influences on these motorneurons (8). He associates the PsMMTsm weak response with possible suprasegmental influences, which are significantly different from those influencing the PsMMT. For a full description refer to the ICAK-USA website (17).

The concept of Deafferentation refers to a loss of afferent input to an area. This can result from various causes including pathology such as a cut nerve or dead nerve following a stroke, or joint dysfunction anywhere in the body etc. It is defined below as used in the treatment of any joint dysfunction as described in AK literature. As the definition below is limited to joint dysfunction, the term will be defined as Functional Deafferentation.

Functional Deafferentation: (19) (21) This refers to reduced mechanoreceptor activity due to any joint dysfunction. This would include the spinal joint dysfunction (also known as the Chiropractic subluxation, or Osteopathic lesion). When the joint dysfunction is corrected, normal afferentation is restored resulting in immediate restoration of central facilitation and inhibition or the muscles affected.

The Physiological Model of the Manual Muscle Test (11) (12) (13).

The connective tissue called “the ground system” according to Pischinger is the substrate of the “ground regulation” which comprises all neural, hormonal and humeral regulating mechanisms of the body. It is the histological and biochemical substrate of the regulation mechanism of the human body. There is a concept of electrochemical connection between capillary, ground substance, and cell, which was developed by Nordenstroem. A lesion or a mechanical stimulus, such as a structural challenge, will activate this system, as the electromagnetic potential of this area will become different from the surrounding tissue. It is felt that there is no neuro-muscular interaction at all without participation of this Matrix System (13).
Electrical stimulation or other energy stimulation can also influence the ground regulation system and thereby the neuronal pool referred to in the Neurological Model above (12).
This model appears to explain the influence of homeopathic treatments and other electromagnetic effects on the manual muscle test.

Muscle Strength and power versus the MMT in Applied Kinesiology:

The descriptions given above for the EsMMT and PsMMT are more of a test of a dynamic quality of neuromuscular response than a test of strength (33). Schmitt has used the phrase “muscle testing as functional neurology”(8). There have been a number of attempts to correlate manual muscle test findings with muscle strength using various forms of dynamometers which have demonstrated poor correlation. Indeed, Blaich and Mendenhall in 1983 concluded that “The manual muscle test and the Cybex machine muscle test are probably independent phenomena, at least as the

of studies that support the manual muscle test as used in applied kinesiology (35). He made the following points:

a) Muscles identified as "weak" using applied kinesiology manual muscle testing methods are in a fundamentally different state than those identified as strong.
b) Muscles testing "weak" using AK are fundamentally different than muscles that are fatigued. In other words, "weakness" is not attributable to fatigue.
c) AK muscle testing procedures can be objectively evaluated via quantifying the Neurologic electrical characteristics of muscles;
d) The cause and effect of applied kinesiology treatment can be plotted over time objectively.

In a later study Caruso, and Leisman (36) determined the following:

a) Examiners with over five years of clinical experience using AK procedures were shown to have reliability and reproducibility when their outcomes were compared.
b) The perception of inhibition or facilitation was made in the initial pressure exerted by the examiner and this was corroborated by test pressure analysis using the instrumentation developed.

Guyton (37) gives the following descriptions relating to strength and power:

- "The strength of a muscle is determined mainly by its size with a maximum contractile force between 3 and 4 kg/cm (squared) of muscle cross section area."
- "The holding strength of muscles is about 40% greater than the contractile strength.
- "The power of muscle contraction is different than muscle strength because power is a measure of the total amount of work that the muscle does in a unit of time. This is determined not only by the strength of contraction but also by its distance of contraction and the number of times that it contracts in one minute.

Baker (33) on terminology states the following: "You cannot evaluate a dynamic process (e.g., dF/dx, the rate of change of force with respect to displacement) with a single static measurement like that produced by a force transducer. You cannot measure the dynamic AK muscle test process without using either instrumentation that measures the dynamic nature of the process or a combination of instrumentation that allows you to calculate the dynamic characteristics of the process." As the contractile strength as defined by Guyton is a single value not descriptive of a dynamic process, the terms "strength," "strong," and "weak" do not accurately depict the dynamic nature of the AK muscle test and should not be used as such. He recommends alternative terms such as conditionally inhibited, conditionally facilitated and conditionally overfacilitated or facilitated, normal, and over-facilitated.

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