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NARRATIVE REVIEW

Applied kinesiology: Distinctions in its definition and interpretation

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Abstract Modification of the motor system in assessing and treating as well as understanding one of the causes of musculoskeletal dysfunctions is a topic of growing importance in healthcare. Applied kinesiology (AK) addresses this interest in that it is a system which attempts to evaluate numerous aspects of health (structural, chemical, and mental) by the manual testing of muscles combined with other standard methods of diagnosis. It leads to a variety of conservative, non-invasive treatments which involve joint manipulations or mobilizations, myofascial therapies, cranial techniques, meridian and acupuncture skills, clinical nutrition and dietary management, counseling skills, evaluating environmental irritants, and various reflex techniques. The effectiveness of these ancillary treatments is believed to be consistent with the expanded construct validity of the manual muscle test (MMT), as described, although this assertion has primarily been tested in outcome studies.

AK and its adjunctive procedures (challenge and therapy localization) are highlighted in this review providing details of its implementation as prescribed by an International College of Applied Kinesiology's Board of Examiners, cited for its scholarly and scientific activities. Because these procedures are believed to identify specific articular, soft tissue, biochemical, or emotional issues underlying muscle function, the applicability of this diagnostic method for all clinicians treating muscle imbalance disorders is described. As of yet, MMT efficacy in therapy localization and challenge techniques has not been established in published, peer-reviewed research.

A variety of challenges likewise remain for professional AK to establish itself as an emerging science, with numerous gaps in the literature and testable hypotheses enumerated. Of

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particular concern are a multiplicity of derivatives of AK that have been described in the literature, which should be greeted with caution in light of the fact that they lack one or more of the essential attributes of AK as described in this report. The validity of these studies which have been critical of applied kinesiology appears in many instances to be no greater than several of the randomized controlled trials, cohort studies, case control studies, and case studies found in this communication to support various aspects of applied kinesiology.

Introduction: rationale and essentials of applied kinesiology

During recent decades, modification of the motor system in both the assessment and treatment of musculoskeletal systems has emerged as a topic of growing importance (Vleeming et al., 2007; Lee, 2004; Sahrmann, 2002; Cowan et al., 2001; Suter et al., 2000). Accordingly, increased or decreased muscle activity and delayed muscular activation—phenomena which affect normal movement patterns (Janda, 1983a)—have become focal points of both clinical and research interest. It is with these facts in mind that a review of Applied Kinesiology (AK) — an integrated system of healthcare which emphasizes muscle function believed to reflect functional neurological responses—is indicated.

Briefly, AK tests muscles before and after applying a variety of challenges and treatments, making clinical judgments based on short-term changes in the muscle thereafter (Walther, 2000). It is generally considered to be a break testing methodology (Kendall et al., 2005), using a binary grading system with reference to the test muscle as "facilitated" or "strong" corresponding to a grade 5, or "functionally inhibited" or "weak" as shown by a grade 4 or less on a 0—5 scale.

In AK, the response of a particular muscle to resistance applied by a trained professional examiner was first proposed by George Goodheart to be a summation of all the excitatory and inhibitory inputs of the anterior horn motoneurons, such that a failure of the muscle in the test could be linked to a dysfunction of the nervous system (Schmitt and Yanuck, 1999; Goodheart, 1964—1998, 1988). In other words, AK has been proposed to be a study of functional neurology. Muscle changes evaluated by the manual muscle test (MMT) are suggested to be reflective of a change in the peripheral or central nervous system, and treatment is considered to be effective only if it is directed at the correct neural disruption (Schmitt and Yanuck, 1999). Disclosed primarily by muscle testing, the aforementioned neural disruption has been proposed to be brought on by disturbances in joint function, lymphatic drainage, the vascular supply to a muscle or related organ, a nutritional deficiency or excess, imbalances in the meridian system, aberrations in the stomatognathic system, or psychosocial stressors (Walther, 2000). Stated more simply, all these systems are interconnected and assumed to influence each other. AK as a tool in the study of functional neurology has been suggested to be a significant *adjunctive* diagnostic probe, used in combination with other clinical findings upon examination. An early study by Carpenter et al. (1977) was executed at the Anglo-European College of Chiropractic to evaluate the muscle—organ association. An organ was irritated, and the muscle associated with that organ was then tested with a dynamometer. Four muscle-organ associations were evaluated: the stomach, the eye, the ear, and lungs. The stomach was irritated by placing cold water into it; the eye with chlorinated water; the ear with sound of a controlled frequency and decibel rate; and the lungs with cigarette smoke. In all cases, the associated muscle weakened significantly more than other indicator muscles after the irritation. Subsequent research was performed by Scoop (1979) to investigate AK MMT correlations with allergic patients. This study employed a Jaymar dynamometer to confirm the AK MMT findings. Schmitt and Leisman (1998) also showed a high degree of correlation between AK procedures used to identify food allergies and serum levels of immunoglobulins for those foods. Blood drawn showed that patients had antibodies to the foods which were found to be allergenic through AK assessment. Conable (2010) evaluated the AK MMT with a thin-film force transducer.

ICAK research has demonstrated correlations between positive MMT findings and other instrumentation that measure muscle force, velocity and timing (Zampagni et al., 2008; Monti et al., 1999; Leisman et al., 1995; Leisman et al., 1989) Moncayo et al. (2004) also monitored 32 patients with thyroid-associated orbitopathy (TAO) using lymph and other thyroid dysfunction measurement tools and showed that AK-guided treatment ameliorated the TAO. The broad array of AK research that correlates AK procedures with other diagnostic probes is presented in Appendix 1, and this research is presented in depth from several platforms (Cuthbert and Rosner, 2011; www.icakusa, 2011; Cuthbert and Goodheart, 2007).

The utility of analyzing disturbed body function by assessing changes affecting the muscles has been previously supported (Kendall et al., 2005; Lewit, 1999; Janda, 1978, 1983a; Kendall and Kendall, 1952). The way to differentiate previous concepts of postural disturbances and those consequent to biomechanical, biochemical, and/or psychosocial aberrations and the MMT as used in AK, is that the latter investigates the immediate changes in muscle function as the result of sensorimotor challenges to these factors taken collectively. This hypothesis was proposed in light of the evidence regarding the reliability and validity of MMT provided in 12 randomized clinical trials, 26 prospective cohort studies, 26 cross-sectional studies, and 10 case—control studies recently reviewed (Cuthbert and Goodheart, 2007). It also derives support from 35 case studies and series shown in Appendix 1, taking into consideration the fact that observational studies have recently become more accepted in constructs of evidence-based medicine (Rosner, 2012). Simons (Simons et al., 1999)