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Literature review

A narrative review of manual muscle testing and implications for muscle testing research

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Abstract

Objective: Manual muscle testing (MMT) is used for a variety of purposes in health care by medical, osteopathic, chiropractic, physical therapy, rehabilitation, and athletic training professionals. The purpose of this study is to provide a narrative review of variations in techniques, durations, and forces used in MMT putting applied kinesiology (AK) muscle testing in context and highlighting aspects of muscle testing important to report in MMT research.

Method: PubMed, the Collected Papers of the International College of Applied Kinesiology–USA, and related texts were searched on the subjects of MMT, maximum voluntary isometric contraction testing, and make/break testing. Force parameters (magnitude, duration, timing of application), testing variations of MMT, and normative data were collected and evaluated.

Results: "Break" tests aim to evaluate the muscle's ability to resist a gradually increasing pressure and may test different aspects of neuromuscular control than tests against fixed resistances. Applied kinesiologists use submaximal manual break tests and a binary grading scale to test short-term changes in muscle function in response to challenges. Many of the studies reviewed were not consistent in reporting parameters for testing.

Conclusions: To increase the chances for replication, studies using MMT should specify parameters of the tests used, such as exact procedures and instrumentation, duration of test, peak force, and timing of application of force.

Introduction

Manual muscle testing (MMT) is used for a variety of purposes in health care by medical, osteopathic, chiropractic, physical therapy, rehabilitation, and athletic training professionals. Different techniques of testing have relevance in different contexts and are not always equivalent.[1-7]

The most commonly held viewpoint is that MMT is an attempt to assess the maximum force a muscle is capable of generating. However, this is not always the case. Given normal innervation, maximum force generated is to a great degree a function of the size of

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the muscle. Yet virtually every health care professional has learned to test muscles to differentiate between nerve root, peripheral nerve, and central nervous system lesions, regardless of the size of the muscle. Such tests are usually submaximal.

In addition to standard orthopedic and neurologic assessments, applied kinesiology (AK) practitioners use MMT to identify what are believed to be immediate neurological responses to a variety of challenges and treatments. Tests of maximum force are actually less relevant to this use. The purpose of this narrative review is to describe AK MMT and point out aspects of muscle testing that should be defined to properly interpret research that involves AK MMT.

Methods

References were found by selectively searching PubMed on the subjects of MMT, maximum voluntary isometric contraction (MVIC) testing, make testing, and break testing. The Collected Papers of the International College of Applied Kinesiology–USA (ICAK-USA) and a convenience sample of related books on AK and muscle testing were hand-searched for articles relating to muscle testing parameters such as force, duration, and timing of force application. The Collected Papers of the ICAK-USA are conference proceedings in which English-speaking AK practitioners initially present their observations before consideration for publication in peer-reviewed journals. Further references were found in the citations in articles identified in the above searches. References were selected if they addressed forces, durations, and technique variations in MMT including normative data. Scientific studies, texts, and theoretical/opinion articles were included. No date limits were used. Isokinetic testing throughout the full range of motion of a muscle's action was not included, as this form of evaluation is highly technical and not directly germane to manual testing. Forty references were included as relevant to this investigation.

Results

Results are summarized in Table 1.

Maximum voluntary isometric contraction

The maximum force a muscle can generate can be measured by MVIC. This is usually done with the

Table 1 Comparison of muscle testing techniques

Method	Force	Time	Scoring	Comments
MVIC[8-10]	Voluntary contraction against a fixed resistance	Until maximum observed 3-6 s	Peak force in pounds or newtons; fine gradations possible	Equipment intensive, time consuming, good stabilization possible
Manual make test[11,12]	Voluntary contraction against tester as "fixed" resistance	1-4 s	Grades 0-5 or as a perceived % of full strength.	Tester must be stronger than subject.[12]
Manual make test with dynamometer[12]	Voluntary contraction against tester as "fixed" resistance	1-4 s[13]	Peak force in pounds or newtons	Tester must be stronger than subject.[12]
Manual break test[11,14]	Resistance to increasing test pressure	1-4 s	Grades 0-5 or as a perceived % of full strength.	Test is stopped when full resistance perceived by tester.
Manual break test with dynamometer[11]	Resistance to increasing test pressure to breaking point	1-4 s[13] Nicholas et al[15] 14 to 60 s	Peak force in pounds or newtons	If test is taken to breaking point every time, tester must be stronger than subject.[12]
AK muscle test[16-23]	Submaximal break test, resistance to increasing test pressure	0.5-3 s	Facilitated/strong (grade 5) vs inhibited/weak (grades 0-4)	Tester may be weaker than subject. Test stopped when "lock" perceived by tester.
AK "G1" or "examiner-started test"[16,24,25,17-19,22,23]	Submaximal break test, resistance to increasing test pressure	≤1 s	Facilitated/strong (grade 5) vs inhibited/weak (grades 0-4)	Tester may be weaker than subject. Test stopped when "lock" perceived by tester.
AK "G2" or "patient-started test"[16,24,25,17-19,22,23]	Make test, with late added pressure	2.5-3.5 s	Facilitated/strong (grade 5) vs inhibited/weak (grades 0-4)	Tester acts as "fixed" resistance to a perceived maximum then adds pressure to attempt to break. May require tester to be stronger than subject.