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Estimating the prevalence of use of kinesiology-style manual muscle testing: A survey of educators

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ABSTRACT

Background: Manual muscle testing (MMT) is a non-invasive assessment method used by a variety of manual therapists to evaluate neuromusculoskeletal integrity. Goodheart developed a technique, Applied Kinesiology, where muscles are tested, not to evaluate muscular strength, but neural control. Following Goodheart's work, a third type of MMT emerged, often referred to colloquially as "muscle testing" or "kinesiology." This type of muscle testing, kinesiology-style MMT (kMMT) typically only uses one muscle, tested repeatedly, to scan for the presence of target conditions, such as stress or food allergies. While AK-MMT has been found to be used by approximately 40% of American chiropractors, little is known about the prevalence of use of kMMT. The aim of this study was to investigate the prevalence of use of kinesiology-style manual muscle testing (kMMT).
Methods: First, a search of Internet databases, textbooks, and expert opinion were used to compile a list of known technique systems that use kMMT. Direct contact was attempted to representatives of each kMMT technique system. Once contacted, the representative was asked to provide a conservative estimate of the number trained in their form of kMMT. For those organisations unable to provide an estimate, expert opinion was sought to approximate the numbers trained. From this data, an estimation of the prevalence of use of kMMT was made.
Results: Seventy-nine kMMT technique systems were identified, 46 of which provided an estimate and 33 did not (for various reasons). From information provided, kMMT was then estimated to be used by over 1 million people worldwide.
Summary: With the prevalence of use at over 1 million people worldwide, kMMT merits further consideration and investigation into its usefulness in clinical settings. This estimation might be amplified due to the possibility of redundancies or attrition. Likewise, it might be low due to misclassification or too narrow search methods.

What this paper adds:

- This is the first study published to estimate of the prevalence of use of kinesiology-style manual muscle testing (kMMT).
- Establishes the widespread use of kMMT.
- A comprehensive listing of technique systems that use kMMT.
- A comprehensive listing of professional kMMT organisations.

1. Background

Manual muscle testing (MMT) is a non-invasive assessment method used to evaluate neuromusculoskeletal integrity [1], and is a fundamental component of physical examinations performed by physiotherapists, chiropractors, osteopaths and some medical specialists [2]. Different health professionals use MMT in different ways, and as a result, there exists some confusion surrounding the term itself, and how the tests are performed and interpreted.

Abbreviations: AK, applied Kinesiology (technique); AK-MMT, Applied-Kinesiology-style manual muscle testing; CRA, Contact Reflex Analysis (technique); EFT, Emotional Freedom Technique; MMT, manual muscle testing; NET, Neuro Emotional Technique; SOT, Sacro Occipital Technique; TBM, Total Body Modification (technique); UK, United Kingdom.

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Consequently, research efforts to assess the validity and clinical utility of MMT have been difficult to design, to conduct and even to understand; and as a result, its usefulness as an assessment method has been called into question [3–7].

2. The evolution of MMT

First described in the literature in 1915 by Lovett and Martin, MMT was originally used to assess muscular weakness in polio patients [8,9]. The tests were crude and generalised, and little was known about their validity.

In 1949, in their benchmark textbook, *Muscles: Testing and Function*, Kendall and Kendall outlined specific methodologies to isolate and test individual muscles or muscle groups [1,10,11]. Currently, it is this type of MMT that is used in orthopaedic, neurology and physical medicine settings to assess neuromusculoskeletal integrity. This form of MMT usually tests for muscular strength or power, and outcomes are typically graded from 0 to 5, and interpreted as 5 being normal [8,11].

In the 1960s, a different use for MMT was developed by a chiropractor, George Goodheart [12]. In Goodheart's technique, called Applied Kinesiology (AK), specific muscles are tested (similar to Kendall and Kendall), not to evaluate muscular strength or power per se, but to evaluate the neural control of muscle function [12]. The basic premise of AK is that when there is some "aberrant nervous system input to a muscle," it is less likely to be able to resist an externally applied force [12]. Therefore, target conditions of AK-style MMT (AK-MMT) include various types of neurologic dysfunction, which then may be related to some altered physiological function, such as organ, endocrine or immune dysfunction [7,12–16]. However, both the origin(s) and the cause(s) of this irregular neurological input are yet unclear and fervently debated. One other notable difference between AK-MMT and the Kendall-style MMT is that in AK-MMT, the outcome is binary, and usually labelled "strong" (or "facilitated") or "weak" (or "inhibited") [12]. So with this divergence in the 1960s, differing viewpoints about MMT began to emerge. While the tests may be similar in appearance, both the purpose of performing the tests and the interpretation of the test results differ significantly.

Following on from Goodheart's work, a third distinct type of MMT emerged. While it is often referred to colloquially as simply "muscle testing," it has also been referred to by other names, such as "kinesiology[1]," "muscle response testing," "arm response testing," "arm testing," "the arm push down test," "muscle monitoring," and others [10]. Examples of technique systems that use kMMT include, but are not limited to: Touch for Health, HeartSpeak, Contact Reflex Analysis (CRA), PSYCH-K, and Total Body Modification (TBM). For clarity, this type of MMT will be referred to as "kinesiology-style MMT" (kMMT), and it is the third generation of MMT which is the subject under investigation in this study.

3. The kinesiology-style Manual Muscle Test

A kMMT muscle test is distinctly different in a number of ways from its predecessors:

(1) kMMT is not as specific as either MMT or AK-MMT;
(2) the applications and interpretations of kMMT results are not standardised;
(3) typically only one muscle, commonly called "the indicator muscle," is used for testing;
(4) the indicator muscle is tested repeatedly as the target condition changes;
(5) the specific muscle used as the indicator muscle is of little significance to the outcome of the test; and finally,
(6) the amount of force applied to the indicator muscle is also not standardised, with variations ranging from a great deal of pressure to an amount barely perceivable.

Point 5 above means that it is not the specific muscle that is of importance, but what the practitioner is testing for (i.e. the target condition) that is fundamental. This is a noteworthy difference between kMMT and AK-MMT. In other words, once the practitioner decides on the target condition and the interpretation of the outcome, any indicator muscle can be used to conduct the test. The selection of indicator muscle may vary with kMMT technique system and practitioner preference, however, a deltoid, hamstring or pectoralis major are commonly utilised.

Nevertheless, kMMT does have some similarities to the other forms of MMT as well. For instance, its basic premise is comparable in that users contend that alterations in efferent nervous stimulation into a muscle, will cause the muscle to weaken [17,18]. Again, the cause(s) and source(s) of these alterations are unclear. Another similarity is that patients are asked to resist the practitioner's applied pressure in an analogous way.

During a kMMT, an external force is likewise applied to a muscle. At first, this practitioner-applied pressure causes an isometric then an eccentric contraction. More explicitly, during a kMMT, the patient holds a specific joint in a fixed position, usually in partial flexion. The practitioner then applies pressure, usually into extension, as the patient resists this pressure using an isometric contraction. For example, the practitioner may ask the patient to hold his shoulder (i.e. the glenohumeral joint) in 90° flexion, palm facing down, while he tests the anterior deltoid (see Fig. 1). Where the practitioner places his own hand for the application of the force into extension is often a matter of contention [10], but the location is routinely on the distal forearm of the patient, just proximal to the wrist joint, with the elbow held in full and locked extension (see Fig. 2). Some muscle testing practitioners disagree with this placement, as it contradicts Kendall's convention of testing one joint at a time [1], since pressure is being applied to both the shoulder and elbow joints simultaneously. The degree of shoulder flexion and abduction and elbow flexion may vary as well. Finally, while the degree of pressure that a practitioner applies can markedly differ, a steady

Fig. 1. Kinesiology-style manual muscle testing (kMMT): an example of one style.

[1] It may be useful to note that there are now two other disciplines that use of the term "kinesiology:" (1) "Kinesiology" as in the study of human movement [Twietmeyer G. What is kinesiology? Historical and philosophical insights. Quest 2012; 64(1): 4–23.], and (2) "Kinesiology Taping" in the field of Physiotherapy/Physical Therapy [Kahanov L. Kinesio taping®, part 1: An overview of its use in athletes. Athletic Therapy Today 2007; 12(3): 17–8.] Both are from different fields altogether, and not related to kMMT.

Fig. 2. Kinesiology-style manual muscle testing (kMMT): an example of where/how a practitioner might place his or her hand on a patient's wrist.

and constant pressure is thought to minimise bias, whereas abrupt and inconsistent pressure is thought to introduce bias into the test [19,20].

Similar to AK-MMT, the test result of kMMT is binary, with the muscle being tested also customarily labelled "weak" or "strong" based on its ability to resist the practitioner-applied force [21]. Although the mechanism of action is disputed, previous research has established that there *is* a significant difference between "strong" muscles and "weak" muscles during a muscle test [3,21–25]. Therefore, the objective of this study in not to assess *if* there is a difference, but instead, to estimate how widespread is the use of kMMT.

4. Applications of kMMT

Within the various technique systems that use kMMT, there exists literally hundreds of potential target conditions that kMMT is used to detect, ranging from physiological dysfunction to meridian imbalance to a patient's level of stress, and others. For example, in a review of the literature, kMMT was found to accurately predict low back pain [26], simple phobia [27], and food allergies [28]. On the other hand, other studies found that MMT was unable to accurately predict nutritional needs [29–31], nutritional intolerance [29,32], thyroid dysfunction [33], exposure to a practitioner-defined noxious stimulus [29,34], and chiropractic subluxation detection and correction [35]. Irrespective of these studies failing to demonstrate sufficient accuracy, practitioners still routinely use kMMT to attempt to detect these conditions [18,36].

There are many other examples of target conditions regularly tested for using kMMT that are not yet supported by clinical research. For instance, in the first course of one popular kMMT technique system (TBM), practitioners are taught to use kMMT to identify depression, anxiety, organ-centred problems, blood sugar problems, autonomic nervous system dysregulation, and overall health status [37]. In addition, another technique, called Neuro Emotional Technique® (NET), also teaches protocols that use kMMT to assess for emotional stress, blood sugar irregularities, and meridian imbalance [38–42]. Like NET, another widely practiced technique called Touch for Health, also uses kMMT to assess for emotional stress and meridian imbalance, and also for food allergies and the need for nutritional supplementation [43].

The wide range of applications and heterogeneity of protocols of use of kMMT contribute to the difficulties of undertaking rigorous trials on the clinical utility of kMMT. Plus, the varying interpretations of its outcomes have caused further confusion, which also must be addressed [10].

5. Study aims

Discussions about assessing the validity of kMMT may be premature. After all, if a test is not in common use, then there is no point in assessing its validity [44]. It has been reported that AK-MMT is used by approximately 40% of American chiropractors [45–47], yet the prevalence of use of kMMT has not yet been estimated. Therefore, the initial purpose of this study was this estimation, which, at first, seemed straight forward. However, when fully explored, it became apparent that it was quite complex. First of all, more than just chiropractors use kMMT in practice. For example, health care practitioners such as some psychologists, acupuncturists, and massage therapists use kMMT, but not all of these types of practitioners do. Also, more than just health care professionals use kMMT, for example, educators, coaches and parents. But not all do either. Moreover, it is widely thought that there are possibly hundreds of different kMMT technique systems and various professional kMMT organisations, the memberships of which may overlap. Finally, since kMMT is not widely accepted and perhaps even thought of as quackery [48–50], it is also possible that people that use kMMT do not want to be known to be using it (i.e. "closet practitioners"), and so may not appear on any formal registry.

Therefore, it quickly became clear that the prevalence of use of kMMT would be challenging to estimate precisely. Consequently, the aim of this study was modified to estimating the number of people formally *trained* to use kMMT. From this information, it then becomes possible to make an informed inference to estimate the prevalence of use of kMMT, which became a second aim of this study.

6. Methods

The first step taken to estimate the number of people trained to use kMMT was to create a list of all organisations that offer or have offered training in kMMT or a system that uses kMMT. Electronic searches were conducted using Google and MEDLINE (May 2008 to November 2009). No time or language restrictions were used. Search terms were ["muscle test*" OR "kinesiology"]. When performing a Google search, pages were examined as presented until saturation was achieved. In addition, books on chiropractic techniques were consulted [51,52], and experts in the field were contacted via telephone, email and social media. The experts were chosen on the basis of the number of years practising the technique (>10 years) and being well-known within the technique-community.

After a list of kMMT techniques/educators was compiled, contact was attempted by both email and telephone, and two specific questions were asked: (1) "*Do you use kinesiology or muscle testing in (their technique)?*" and if yes, then: (2) "*In your best conservative estimate, how many people have been trained in (their technique)?*" The technique system was included if the response was "Yes" to the first question. Data was collected between May 2008 and November 2014. As a further check, experts in each technique system (as described above) have been consulted to affirm that the data reported is a best estimate.

For completeness, a list of kMMT professional associations was also compiled, but no membership information (e.g. size) was sought at this time. This protocol received ethics committee approval.

7. Results

Seventy-nine technique systems were identified to use some form of kMMT. Despite attempts to contact all organisations, only 46 provided estimations of the number of people trained in their technique (see Table 1). Of the 33 organisations that did not provide estimates, some were not contactable (e.g. no current contact information was found), some did not respond to contact, some stated that an estimate could not be provided, and some refused to answer. Instead, in these instances, 2 or 3 experienced practitioners in these techniques were consulted to provide consensus estimates of the number of people trained in their

Table 1
Estimated number of people trained in various manual muscle testing techniques.

	Rank	Estimated # Trained	Technique System Name	Anacronym
Technique representative provided information	1	200,000	Touch for Health	TFH
	2	120,000	Applied Kinesiology	AK
	3	100,000	Sacro-Occipital Technique	SOT
	4	80,000	Thought Field Therapy	TFT
	5	80,000	Contact Reflex Analysis	CRA
	6	70,000	PSYCH-K	
	7	65,000	Total Body Modification	TBM
	8	45,000	Yuen Method	
	9	35,000	Educational Kinesiology / Brain Gym	Edu-K
	10	40,000	Nambudripad's Allergy Elimination Technique	NAET
	11	35,000	Bio-Energetic Synchronization Technique	BEST
	12	25,000	RESET TMJ	
	13	25,000	Health Kinesiology	HK
	14	15,000	Advanced Energy Psychology™	ARP
	15	12,000	Applied Physiology	AP
	16	12,000	Neuroenergetic Psychology	NEP
	17	12,000	Neural Organization Technique	NOT
	18	6,000	Neuro Emotional Technique	NET
	19	3,500	Intuitive Kinesiology	
	20	3,500	Metabolics - Functional Biochemistry	
	21	3,000	Kinergetics	
	22	3,000	Neuro Impulse Protocol	NIP
	23	2,800	Chirodontics	
	24	2,500	Human Ecology Balancing Science	HEBS
	25	2,500	Manual Kinesiology	MAK
	26	2,200	Psychosomatic Energetics	PSE
	27	2,200	Cranial Release Technique	CRT
	28	2,000	Chiro Plus Kinesiology	CPK
	29	2,000	Neuro Energetic Kinesiology	NEK
	30	1,500	Dobson Muscle Testing Technique	DMT
	31	1,500	Matrix Response Testing	MRT
	32	1,500	One Brain (aka 3-in-1 Concepts)	
	33	1,200	Integrative Kinesiology	IK
	34	1,000	Foundation Clinical Kinesiology	
	35	1,000	Neuro-Modulation Technique	NMT
	36	1,000	Zahnärztliche PhysioEnergetik" (Dental Physioenergetics)	ZÄPE
	37	700	Aromatic Kinesiology	
	38	500	(The) Vickery Method	TVM
	39	500	Integrated Biodynamics	IBD
	40	500	Systematic Kinesiology	
	41	250	Synergistic Kinesiology	
	42	150	Allergy Pathway	
	43	120	Extreme Kinesiology	XK
	44	120	HoloDynamic Kinesiology	HDK
	45	60	Kinesiologie nach Gauer	
	46	50	Chirokinetic Therapy	CKT
		1,017,850	*Subtotal*	
Technique representative did not provide information*	47	30,000	Emotional Code	
	48	15,000	Clinical Kinesiology	CK
	49	15,000	BodyTalk	
	50	10,000	NeuroLink	
	51	5,000	Be Set Free Fast	BSFF
	52	5,000	Learning Enhancement Advanced Program	LEAP
	53	5,000	Nutritional Response Testing	NRT
	54	5,000	Wholistic Kinesiology	
	55	3,500	Professional Kinesiology Practice	PKP
	56	3,000	Power vs. Force system	
	57	3,000	Wellness Kinesiology	
	58	2,000	Biokinesiology	BK
	59	2,000	Integrative Manual Therapy	IMT
	60	2,000	NeuroLinguistic Kinesiology	NLK
	61	2,000	Progressive Kinesiolgy	
	62	1,000	Advanced Allergy Therapeutics	
	63	1,000	Applied Psychoneurobiology	APN
	64	1,000	Autonomic Response Testing	ART
	65	1,000	Balance Kinesiology	
	66	1,000	Brain Integration Technique	BIT
	67	1,000	Cyberkinetics - Cybernetic Kinesiology	
	68	1,000	Energetic Kinesiology	
	69	1,000	Energy Consciousness Therapy	ECM
	70	1,000	Energy Diagnostic & Treatment Methods / Advanced Energy Psychology	EDxTM
	71	1,000	EnergyField Kinesiology	
	72	1,000	Negative Affect Erasing Method	NAEM
	73	1,000	Neural Systems Kinesiology	
	74	1,000	Neuro Organization Work	NOW
	75	1,000	Neurobiology / Neural Therapy / Psycho-Kinesiology	
	76	1,000	Physioenergetik	
	77	1,000	Riddler Reflex Technique	
	78	1,000	Stress Indicator Point System	
	79	1,000	Transformational Kinesiology	TK
		125,500	*Subtotal*	
		1,143,350	**TOTAL**	

* Reasons for not providing information include: (1) Not contactable, (2) Not responding to contact, (3) Not being able to provide estimate, and (4) refusing to provide an estimate.

respective technique systems, and these consensus estimates are also included in Table 1.

From the information provided by the 46 contributing technique systems, it can be inferred that over 1,000,000 people were trained to use kMMT. In addition, it was estimated that another 125,500 people were trained in the use of kMMT in the 33 technique systems which did not provide information. Therefore, it was estimated that over 1 million people were trained to use kMMT.

In addition, 65 professional associations or schools of kMMT were identified globally. For completeness, a list can be found in Table 2.

Table 2
Kinesiology Organisations and Schools.

	Professional Association or School	Country	Website
1	Association of Specialised Kinesiologists – KwaZulu-Natal	South Africa	www.kinesiology.co.za
2	Association of Specialised Kinesiologists South Africa	South Africa	www.kinesiologysa.co.za
3	Australasian College of Kinsesiology Mastery	Australia	www.kinesiologymastery.com
4	Australian Kinesiology Association	Australia	http://www.kinesiology.org.au/
5	Berner Institut für Kinesiologie/Institut Bernois de Kinésiologie	Switzerland	www.bik.ch
6	Biokinesiolog Skolen	Denmark	www.kbhkinesiologiskole.dk
7	College of Complementary Medicine – Australia	Australia	www.complementary.com.au
8	Dansk Pædagogisk Kinesiologiskole	Denmark	www.kinesiologi-uddannelse.dk
9	Danske Kinesiologer	Denmark	www.kinesiologi.dk/
10	Den Norske Kinesiologi Forening	Norway	www.dnkf.org
11	Den Norske Kinesiologi Skolen	Norway	
12	Deutsche Gesellschaft für Angewandte Kinesiologie	Germany	www.dgak.de
13	Deutschen Ärztegesellschaft für Applied Kinesiology	Germany	www.daegak.de
14	Energy Kinesiology Association USA	USA	www.ask-us.org
15	Fédération Belge de Kinésiologie	Belgium	www.kinesiologybelgium.org
16	Health Umbrella Kinesiology Practitioners	UK	www.healthumbrella.co.uk
17	I.K.S.E.N.	Italy	www.iksen.it
18	Institut Belge de Kinesiologie	Belgium	www.ibk.be
19	Institut für Angewandte Kinesiologie	Germany	www.iak-freiburg.de
20	Institut für Kinesiologie Zürich	Switzerland	www.kinesiologie.edu
21	Integrated Practitioner Training	UK	www.integrated-kinesiology.co.uk
22	International Association of Specialised Kinesiology	Worldwide	www.iask.org
23	International College of Applied Kinesiology	Worldwide	www.icak.com
24	International College of Applied Kinesiology – Australasia	Australia	www.icak-australasia.com
25	International College of Applied Kinesiology – Austria	Austria	www.icak-d.de
26	International College of Applied Kinesiology – Benelux	Belgium, Netherlands, Luxembourg	www.icakbenelux.com
27	International College of Applied Kinesiology – Brasil	Brazil	www.icak.com.br
28	International College of Applied Kinesiology – Canada	Canada	www.icakcanada.com
29	International College of Applied Kinesiology – Germany	Germany	www.icak-d.de
30	International College of Applied Kinesiology – Korea	Korea	www.ak.or.kr
31	International College of Applied Kinesiology – UK	UK	www.icak.co.uk
32	International College of Applied Kinesiology – USA	USA	www.icakusa.com
33	International Institute of Kinesiology	Australia	www.iikinesiology.com
34	International Kinesiology College	Australia/Worldwide	www.ikc-info.org; www.tfhka.org
35	International Medical Society for Applied Kinesiology	Austria	www.imak.co.at
36	International NeuroKinesiology Institute	Poland	
37	Internationale Kinesiologie Akademie	Germany	
38	Japan Touch for Health Association	Japan	www.touch4health.ne.jp
39	KinAP	Switzerland	www.kinap-verband.ch
40	Kinesiologiforeningen	Denmark	www.kinesiologiforeningen.dk
41	Kinesiology College of Canada	Canada	www.kinesiologycollegeofcanada.com
42	Kinesiology College of Ireland	Ireland	http://www.kinesiologycollege.com/
43	Kinesiology College of Ireland	Ireland	http://www.kinesiologyireland.com/
44	Kinesiology Federation of UK	UK	www.kinesiologyfederation.org
45	Kinesiology Institute	USA	www.kinesiologyinstitute.com
46	KineSuisse	Switzerland	www.kinesuisse.ch
47	Klinghardt Academy – Germany	Germany	http://www.ink.ag/
48	Klinghardt Academy – UK	UK	http://www.klinghardtacademy.com/
49	Klinghardt Academy – USA	USA	
50	Nordiska Praktorskolan	Sweden	www.praktor.com
51	Österreichischen Berufsverband der Kinesiologen	Austria	www.kinesiologie-oebk.at
52	Praxis Integrative Achberg	Germany	www.integrative.de
53	Sammenslutningen af Alternative Behandlere	Denmark	www.alternativ-behandling.dk
54	Schweizerischen Berufsverbandes der Kinesiologinnen und Kinesiologen	Switzerland	www.kinesiologie-ch.ch
55	Schweizerischer Berufsverband für Kinesiologie	Switzerland	www.iask.ch
56	Schweizerischer Verband Nicht-Medizinische Kinesiologie	Switzerland	www.svnmk.ch
57	Svenska Kinesiologiskolan – Swedish School of Manual Kinesiology	Sweden	www.kinesiologi.se
58	Sveriges Yrkesutbildade Kinesiologer	Sweden	www.kinesiolog.se
59	The Academy of Systematic Kinesiology	UK	www.kinesiology.co.uk
60	The Association of Systematic Kinesiology, ASK	UK	www.systematic-kinesiology.co.uk
61	The British Kinesiology Centre	UK	www.britishkinesiology.co.uk
62	Topping International Institute Inc	USA	www.wellnesskinesiology.com
63	Touch For Health Instructors Association – Australia	Australia	www.touch4health.org.au
64	Touch For Health Kinesiology Association – USA	USA	www.tfhka.org
65	Vida Kinesiología	Spain	www.vidakine.org/

UK, United Kingdom; USA, United States of America.

8. Discussion

It is conservatively estimated that over 1 million people worldwide were trained in some form of kMMT technique system. However, there are several limitations in this study that may be sources of either overestimation or underestimation in the actual figure. Firstly, there are a number of potential sources of overestimation that must be noted. For instance, there are likely redundancies in this report since many kMMT practitioners undertake training in more than one kMMT technique system. Therefore, it is likely that a kMMT trainee has been counted repeatedly. Consequently, this may have inflated the estimation. In addition, it is also likely that not all those trained actually practice or routinely use the kMMT technique system they were trained in, which may also be a source of overestimation of the prevalence of use. Similarly there are a various potential sources of underestimation. For example, if an organisation did not have a presence on the World Wide Web, then it is likely that it was not included in the list (Table 1), and therefore, not contacted. Such would be the case with small or local kMMT educators, not part of larger organisations. Also not included were organisations that do not use kMMT as part of their formal training, but whose practitioners routinely use kMMT within the technique system in practice. One example of such an organisation is Body Talk. With over 100,000 people trained in BodyTalk, it is a noteworthy omission. However, BodyTalk does not officially teach kMMT, but uses another similar dichotomous test to navigate through a session (J. Veltheim, personal communication, 2010). Nevertheless, kMMT is used routinely by BodyTalk practitioners, as can be evidenced by a simple search for "BodyTalk" on a website such as YouTube (www.YouTube.com). Another example of this is with Emotional Freedom Technique (EFT), which is practiced widely around the world and is growing in popularity. Like BodyTalk, EFT purportedly does not teach seminar attendees to use kMMT, but EFT practitioners have been known to use kMMT in practice within EFT protocols. Therefore, these may be other causes of underestimation of the prevalence of use of kMMT.

Because of the difficulty of the research question, and because of these potential sources of error, it was speculated that the overestimation would offset the underestimation for a current best case estimation of prevalence of use.

It might be noted by critics that there are technique systems included in this report that some would argue do not use kMMT. One example would be AK, which mainly uses MMT in the way Kendall and Kendall describe [1,11,12]. However, many AK practitioners use one indicator muscle for therapy localisation, which can be considered a form of kMMT; and therefore, AK and AK practitioners were included in this survey. Likewise, Sacro Occipital Technique (SOT), a commonly used chiropractic technique [45–47], is not considered a kMMT-technique per se. Nevertheless, SOT uses the "arm fossa test" during assessment of a patient, which can also be considered a form of kMMT [53–55]. Therefore, SOT and SOT practitioners were also included in this report.

Taking into account the results of this survey and these potential sources of over- and underestimation, the prevalence of use of kMMT can be inferred to be over 1 million practitioners worldwide.

The implications of these results are significant. The prevalence of use is extensive, and yet kMMT is not accepted as a valid assessment tool and even considered by some to be charlatanism [50,56–64]. This suggests a necessity to undertake rigorous research to explore the true usefulness of kMMT in clinical settings. The first step in this process should be to determine its clinical validity by undertaking diagnostic test accuracy studies [44]. A second step would be to determine its precision (i.e. reproducibility and repeatability) [44]; that is, whether it can be relied upon in different clinical settings, with the same and different patients, and over various timeframes. Finally, its clinical utility must be assessed, which means answering the question: *Does incorporating kMMT in patient management improve patient outcomes or overall quality of life?* [44] This last step entails assessing the effectiveness of the various kMMT technique systems (see Table 1) using randomised, controlled trials.

The process of validating kMMT is in its early stages. However, the results of this study indicate that the prevalence of use of kMMT is widespread enough to warrant further investigation.

9. Summary

Through Internet searches, surveys, personal communications and expert opinion, kMMT has been estimated to be used by over 1 million people worldwide. This estimation might be amplified due to the possibility of redundancies or attrition. Likewise, it might be low due to misclassification or too narrow search methods. Regardless, the widespread use of kMMT merits further consideration and in-depth exploration of its usefulness in clinical settings.

Competing interests

The author declares that she has no competing interests – financial or otherwise. AJ completed this research in partial fulfilment for the degree of Doctor of Philosophy (DPhil) in Evidence-based Health Care through the University of Oxford, UK.

Author contributions

AJ conceived of the study, performed the literature search, designed the methods, collected and analysed the data, and drafted the manuscript for submission.

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Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at doi:10.1016/j.aimed.2015.08.003.

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