



Research paper

Muscle testing for lie detection: Grip strength dynamometry is inadequate

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ABSTRACT

Introduction: Although DMT is primarily used in the diagnosis of neuromusculoskeletal (NMS) disorders, previous studies have attempted to use other forms of manual muscle testing (MMT) to detect conditions other than NMS. For instance, muscle response testing (MRT) was used to distinguish lies (a known stressor) from truth. Therefore, it is hypothesised that DMT might be used to detect deceit as well, and the aim of this study was to investigate if grip strength via dynamometric muscle testing (DMT) could be used to distinguish lies from truth. **Methods:** A prospective study of diagnostic test accuracy was carried out. Twenty participants, aged 18–65 years, with healthy hands, were recruited. Participants were given a visual stimulus and followed an auditory instruction to lie or to tell the truth about the stimulus, before recording grip strength with a dynamometer. Testing proceeded in this manner until 20 DMTs were performed, 10 by each hand. We analysed the accuracy of grip strength for detecting lies.

Results: The mean grip strength after true statements was found to be 24.9 kg (95% CI 20.3 to 29.6), and after false statements, 24.8 (95% CI 20.2 to 29.5), which were not statistically different ($p = 0.61$).

Conclusion: DMT via hand-held grip strength dynamometry failed to distinguish lies from truth. These results seem to suggest that strength as measured by DMT is not impacted by deceit. A limitation of this study is it is not generalisable to other types or applications of MMT or MRT or to other target conditions.

1. Introduction

Muscle Response Testing (MRT) is a type of manual muscle testing (MMT) used by integrative health care providers to assess not muscular strength, but rather, MRT, a binary test, is used to detect other specified target conditions. The tester applies a force to an indicator muscle and labels the outcome as either “weak” or “strong” depending on the muscle’s ability to resist the force. MRT is a commonly used in kinesiology techniques, such as Applied Kinesiology, HeartSpeak and Total Body Modification. This paper reports one study in a series of scientific experiments designed to assess the validity, accuracy and precision of muscle response testing (MRT).

Previous studies in this series demonstrated that MRT could be used to distinguish lies from truths [1,2]. As a comparator, in this study the practitioner-applied testing of MRT was replaced with an objective instrument, a handheld or grip-strength dynamometer (HHD; see Fig. 1), in order to assess its usefulness in the same application: to distinguish lies from truths.

Muscle strength testing is typically used to diagnose neuromusculoskeletal (NMS) disorders, however in recent times other applications

have emerged. One type of MMT, MRT, arose from Goodheart’s Applied Kinesiology and other techniques in the 1980’s [3,4], and is estimated to be used by over 1 million people worldwide [5]. MRT is distinct from other types of MMT in that typically only one muscle (usually the deltoid) is tested repeatedly, to detect the presence of potential target conditions, such as food allergies [6–10], phobia [11,12], and deceit [1,2]. However, despite its widespread use, many clinicians argue that MRT lacks credibility and validity (e.g. inter-examiner reliability) [5,13].

In an effort to quantify muscle strength measurement, and thereby gain objectivity, instruments such as the HHD were developed. Dynamometric muscle testing (DMT) has been shown to be reliable in different populations [14–16], and subjective practitioner judgement of muscle strength by MMT has been shown to correlate well with muscle strength measured objectively by HHD [17–21]. In addition, DMT correlates well with other forms of MMT [17], and its intra-subject test–retest variability has been found to be small [22].

If the loss of muscle strength is the underlying mechanism behind the observed ability of MRT to distinguish lies from truth, it suggests that DMT should also be able to distinguish lies from truth [17]. The

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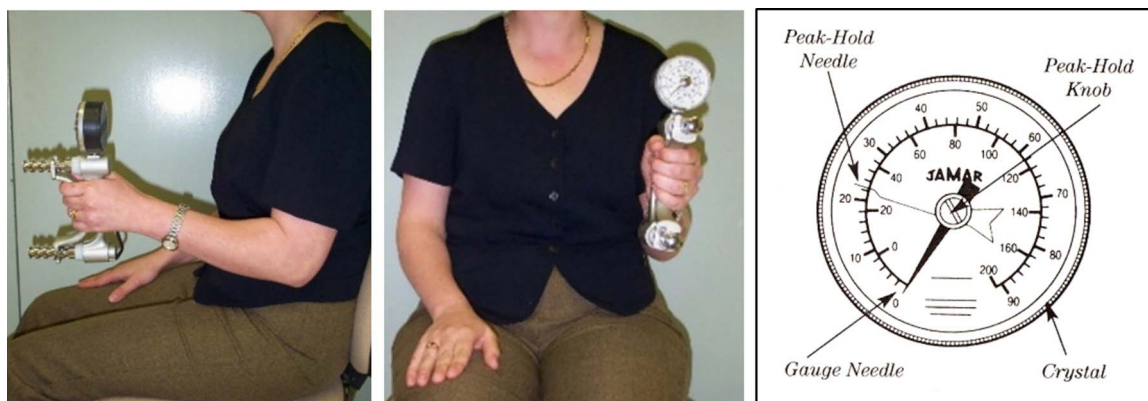


Fig. 1. (A) and (B) Proper positioning during grip strength dynamometry; (C) Sample face of a grip strength dynamometer.

aim of this study is to assess whether muscle strength (via DMT) can distinguish lies from truth.

2. Methods

This was a prospective diagnostic test accuracy study. No participant was assessed prior to enrolment. This protocol received ethics committee approval by the Oxford Tropical Research Ethics Committee (OxTREC; Approval #41-10) and the Parker University Institutional Review Board for Human Subjects (Approval # R19_10). In addition, this study protocol was prospectively registered with two clinical trials registries: the Australian New Zealand Clinical Trials Registry (ANZCTR; www.anzctr.org.au), and US-based ClinicalTrials.gov. Written informed consent was obtained from all participants. This study is reported in accordance with the Standards for the Reporting of Diagnostic Test Accuracy Studies (STARD) guidelines [23–26].

2.1. Overview

Participants were given a visual stimulus (a picture displayed on a computer screen: for example, an apple) and followed an auditory instruction to lie or to tell the truth about the stimulus, before recording grip strength with a dynamometer. We analysed the accuracy of grip strength (via DMT) for detecting lies. This study is one in a series of studies assessing the validity of MRT, and as such it follows a similar protocol [1,2].

2.2. Participants and setting

Participants had to be aged between 18–65 years, have fully functioning and pain-free hands, and be fluent in English. Volunteers were excluded if they had visual, auditory or speech impairment. Both MRT-naïve and non-MRT-naïve participants were eligible for enrolment. Recruitment was by direct contact, social media and word of mouth. All recruitment took place in the states of Texas and New York, USA.

Each participant was given a Participant Information Sheet (PIS) and gave written informed consent. Pre- and post-test questionnaires (see Supplements 1 & 2, respectively) were completed by each participant to collect demographic information and participant opinions.

2.3. Test methods

The index test under investigation was hand-held grip strength DMT, which was compared to the actual verity of the spoken statement (i.e. the reference standard), and the target condition was deceit. Each participant performed 20 DMTs after speaking an instructed statement out loud, 10 with their dominant hand and 10 with their non-dominant hand, broken up into blocks of five: 5 dominant, 5 non-dominant, 5 dominant, 5 non-dominant. Participants always started with their

dominant hand and ended with their nondominant hand.

Visual stimuli in the form of neutral pictures were randomly presented on a computer screen viewed by the participant. In addition, a verbal instruction was also randomly generated by the computer and paired with the picture, in which the participant was instructed to speak a true or false statement about the viewed picture. For example, on the computer screen might be presented an apple, and the participant might be instructed to say this true statement: “Say, ‘I see an apple.’” Alternatively, the participant may be instructed to say a false statement, such as, “Say, ‘I see a boat.’” Immediately after speaking the true or false statement, the participant then performed the DMT.

The stimuli presented were selected from a database of 100 affect-neutral pictures/statements. DirectRT© Research Software (Empirisoft Corporation, New York, NY) was programmed to randomly present a unique sequence of stimuli for each participant, randomising the verity of the statements (i.e. true or false) and keeping the prevalence of false statements constant at 0.50.

2.3.1. Grip strength dynamometry

All DMT was performed using the same factory calibrated hydraulic JAMAR (Model J00105, Lafayette, Indiana, USA) analogue hand-grip dynamometer and employing a standardised approach. This brand of dynamometer is the most widely used, and has proven inter-rater, intra-rater, and test-re-test reliability [27]. Participants were instructed to squeeze the dynamometer for 5 s, giving a maximum effort each time. They could rest as needed. The examiner read the scale (in kilograms, kg) on the dial face, which was facing away from the participant, and after recording the result, reset the peak-hold needle to zero, ready for the next effort. Grip strength was measured to the nearest 1 kg.

2.3.2. Procedures

The participant was seated comfortably in front of a computer and held the dynamometer vertically in his hand, elbow at his side and bent to 90°, forearm and wrist in neutral (i.e. palm facing medially). The dial of the dynamometer was facing away from the participant such that it was out of his view. See Fig. 1. One investigator (AJ) collected all data for this study. During testing, she was seated in front and to the side of the participant, positioned so that she could read the dial of the dynamometer, and was also unable to see the participant’s computer screen. For the testing scenario layout, see Fig. 2. One repetition of DMT consisted of: (1) participant viewed a picture, (2) participant was instructed (via an earpiece) to say a statement in relation to the picture, (3) participant took the DMT position, (4) while viewing the picture, participant spoke the instructed statement, (5) participant immediately performed the DMT, and (6) the examiner recorded the grip strength result directly into the computer, which advanced the screen to the next picture/statement. Testing proceeded in this manner until 2 blocks of 5 DMTs were performed by each hand.

In the post-testing questionnaire (see Supplement 2), participants

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