Surface EMG and the Reactive Leg Reflex: a Proposed Methodology to Evaluate a Dichotomous Neurophysiologic Reflex with Diagnostic Potential.

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Abstract:

Introduction: Various methods of patient evaluation using diagnostic biofeedback exist which attempt to gather dichotomous ("yes" verses "no", strong verses weak) information from the patient's body regarding neurophysiologic states, chiropractic subluxation, disease and pre-clinical conditions and causes [1,2,5,6,11]. This type of analysis is theoretically monitoring a distinct sensory modality dedicated to information regarding stored stress patterns and states. There are conflicting views on the validity of manual muscle testing and other dichotomous neurophysiologic diagnostic biofeedback tests currently used in fields such as chiropractic, osteopathy, neurology, naturopathy, dentistry and others [4,7,8,9,10]. This paper proposes a methodology to study this phenomenon in a relatively objective manner using two case study sEMG data sets with qualitative analysis as examples. The core diagnostic test of a chiropractic technique, Directional Non-Force Technique®(DNFT®) uses a test described as the Reactive Leg Reflex (RLR) to identify and monitor stored anatomical stress patterns [1,3]. The RLR procedure has inherent qualities such as subject testing passivity, and test procedure consistency which make this test a good candidate for studying the neurophysiologic biofeedback phenomena. The methodology herein offers a proof of concept to evaluate this currently theoretical but clinically utilized and understudied distinct sensory modality.

Methods: Surface electromyography (sEMG) and associated software [14] were used to record analogous muscle tone changes associated with the dichotomous RLR test result observed clinically during a DNFT chiropractic analysis. Audio of the analysis was matched with the sEMG data stream to identify sEMG patterns specific for testing aspects and test result. A third party marked test initiation and test conclusion with a parallel data channel using a DC marker allowing audio and sEMG data alignment and qualitative analysis. Subject 1's data set includes testing of anatomic structures for stored stress patterns (chiropractic subluxation) and test result. Subject 2's data set includes testing of structures, test results and Directional Non-Force Technique chiropractic adjustment of two identified (via the RLR) subluxated structures: left meniscus and left tibialis anterior muscle. Resulting sEMG data patterns were then analyzed qualitatively.

Results: Subject 1's data set includes distinct sEMG patterns correlating to aspects of the RLR test including test initiation, duration of test, and end of test. Distinct sEMG markers identifying dichotomous "yes" verses "no" responses are also discussed. Subject 2's data set includes distinct markers for RLR test initiation, duration and end of test as well as an unexpected electrocardiograph (ECG) artifact measured in the sEMG monitored quadriceps muscles. The observed ECG artifact appears after a left meniscus adjustment and increases in amplitude and

frequency. During and after a left anterior tibialis muscle adjustment, the ECG artifact disappears from the data stream.

Conclusion: The methods and findings described herein offer a proof of concept methodology to study and identify aspects of neurophysiologic diagnostic biofeedback utilized across heath care professions. Continued research using this methodology with quantitative and quantitative analysis of sEMG, EEG and fMRI data could answer current unknowns regarding the anatomic location and neurologic mechanisms associated with this clinically utilized but understudied diagnostic sensory modality.

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