



HOW OBTAIN A GOOD CALIBRATION IN SSEMG PROTOCOL

Marian Turbatu^{1,2}, Laura Pittari^{1,3}, Teresa Laborante¹, Alessandro Nota¹, Simona Tecco¹

¹Department of Dentistry, Dental School, Vita-Salute San Raffaele University, IRCCS San Raffaele Hospital, Milan, Italy; ²Doctoral School of Dental Medicine, Titu Maiorescu University, Bucharest, Romania; ³Department of Clinical Medicine, Public Health, Life and Environmental Sciences - MeSVA, University of L'Aquila, L'Aquila, Italy; University Vita-Salute San Raffaele, Milan, Italy.

Surface electromyography (sEMG) of the masticatory muscles is widely employed in dentistry and gnathology for the functional assessment of the neuromuscular system [1]. The recorded signal reflects the motor unit activity, and it is influenced by multiple biological factors, including neuromuscular recruitment, functional muscle length, baseline tone, and integration with the cranio-cervical system [2]. Alongside physiological biological variability, however, a methodological component may substantially affect data quality and interpretability. Normalization through clenching on posterior cotton rolls represents the most adopted calibration approach in dental sEMG [3]. The aim is not to obtain an absolute value, but to ensure signal comparability across sessions and experimental conditions. Within this framework, calibration repeatability and signal super-imposability represent key indicators of methodological reliability [4]. This presentation proposes methodological considerations on calibration standardization, with particular emphasis on the temporal stability of the reference condition. A structured operational protocol is described, including electrode placement according to shared guidelines, control of patient posture (cranio-cervical alignment, gaze position, trunk stability), precise definition of the calibration site, and systematic documentation of the recording setup. Experimental examples demonstrate how

signal superimposability seems dependent on calibration reference consistency, whereas undocumented variations in the reference calibration condition may compromise inter-session comparability, even with identical electrode placement. The ultimate objective is to offer a methodological contribution aimed at ensuring repeatable calibration over time by explicitly integrating the standardization of the calibration into the recording protocol, also considering postural characteristics of the subject [5]. Measurement quality in sEMG fundamentally relies on signal reproducibility under identical operating conditions, and on signal interpretation. Within this framework, the sEMG signal should not be interpreted as an absolute value, but rather as the outcome of the interaction between biological variability and methodological factors, the latter being controllable through rigorous protocol standardization. Although biological variability is inherently unavoidable, methodological variability remains under operator control and must be minimized. Consequently, minimizing methodological variability becomes essential for ensuring reliability, inter-session comparability, and robustness of clinical interpretation. In sEMG, the critical issue is not the absolute magnitude of the signal, but the ability to reproduce it consistently over time under stable and standardized conditions.

Keywords: Surface electromyography, calibration protocol, signal normalization, methodological reliability, postural standardization