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KINEMATIC AND ELECTROMYOGRAPHIC FEATURES OF UPPER-LIMB MOVEMENT PERFORMED BY HEALTHY AND POST-STROKE PATIENTS

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It is extremely difficult to simplify the relation between several body parts, which perform human motion, into one set of features. Mainly, the upper-limb is capable of a wider range of actions, going from fine manipulation to prehension and grasping. Aiming to describe its complexity, several studies have been conducted in order to better understand the upper-limb specificities. However, most of studies restrain the task to pointing (Soechting, Lacquaniti, 1981), reaching (Wu, Trombly, Lin, Tickle-Degnen, 2000) or grasping (Yang, Zhang, Huang, Jin, 2002), which seems not enough to explain the wide range of tasks possible to be performed in a daily scenario. Moreover, the upper-limb is more dependent on processes related to decision making (Silva, 2013) and involves greater multijoint coordination movements (Aprile, 2014), than the lower-limbs. Due to these reasons, the parameterization of the upper-limb motor action is still scarce and not consistent. rnFurthermore, along with motor action execution, there is an activation of the neuro-musculoskeletal system. Some studies reported that, depending on the task to be performed, this system could be activated sooner than the moment of movement initiation (Zattara, Bouisset, 1988) and more sustained in time (Haggard, Clark, 2003). Additionally, the amplitude of the muscle activity could be informative of the properties of the target to be manipulated (Fligge, Urbanek, van der Smagt, 2013). Recently some researchers have been using simultaneous recording of motion capture and EMG data in order to classify human motor actions (Pradhan, 2007), although in a non-clinical population.rn There is a difficulty in establishing a solid protocol for certain goal-oriented tasks, mainly in the tools to collect data and in the joints or anatomical portions of the limb that are more informative for the specific task. Therefore, we propose a methodology to assess the upper-limb motor action in a set of daily functional tasks. In this study, we assess the role of target location in the workspace, the instruction given and the type of object. A workspace was defined for the execution of the motor tasks, with several marked positions according to the participant (0º, 22.5º and 45º) and at two distances (100% and 120% of functional distance). Motion capture and electromyographic data was simultaneously recorded in order to understand whether the type of object and instruction have an effect in the time of muscular activation and in performance. Participants were instructed to reach and drink from a bottle or to lift either a bottle or a solid paper tube. With this study we aim to characterize the upper-limbs motor action regarding functional tasks as well as to identify the tasks and environmental features causative of changes for a control and post-stroke patients' sample. We expect to find an effect of EMG activation on the intentionality of the task and type of object for both groups. We also expect the movement segmentation to be informative of the quality of the movement (e.g. smoothness) and performance.