The effect of posture during CPR on rescuer muscular fatigue development and CPR quality
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Cardiopulmonary Resuscitation (CPR) allows rescuers to oxygenate the blood by means of ventilations while generating artificial cardiac output by means of chest compressions. CPR, like any workplace task of concern, involves repetitive forces and extreme postures that can reduce the effectiveness of the task and increase the risk of injury to the worker. Fatigue of the rescuer is a critical component of CPR quality, influencing the ability of a rescuer to achieve minimum chest compression depth, rate, and chest recoil. The purpose of this study is to identify which specific muscles demonstrate evidence of fatigue during CPR under a range of postural conditions. Healthcare providers, first responders, and lay rescuers trained to a BLS level will participate in this study. The study will determine the participants' muscular activation using surface electromyography, chest compression depth of the CPR manikin using motion capture technology, and force exerted on the manikin using force plates. Participants will undergo 4 trials of CPR performed at different mannequin heights, where each trial will require a different posture. CPR will be performed at a ratio of 30 compressions to 2 ventilations (30:2). The varying heights participants complete CPR on during the study will represent the heights CPR is performed on most often. During the entirety of each trial, participants' movements, electromyography, and force will be collected using the biomechanical instrumentation listed above. Once the data has been collected multiple custom MatLab scripts will be written to filter and analyze the data. The data will then be used to gain an understanding of which muscles fatigue as a function of the posture used and the relationship between muscle fatigue and CPR effectiveness. The results of this research will be used to develop postural adaptations for the rescuer to improve CPR quality while minimizing the fatigue of the rescuer.