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Letter to the Editor

Muscle Strength is not the only Predictor of High-Quality Cardiopulmonary Resuscitation

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Letter to the Editor

We read with interest the article by Chi *et al*. on the relationship between muscular fitness and performance in cardiopulmonary resuscitation (CPR) using continuous chest compressions (CCC) and the 30:2 strategy, and on the determination of fitness-based thresholds for predicting effective chest compressions [1]. In 57 healthcare professionals, handgrip strength showed the strongest correlation with compression force and depth across all time intervals and CPR strategies compared to push-ups and crunches [1]. The 30:2 CPR consistently produced higher compression force and depth compared to CCC, with the differences increasing over time [1]. The study is interesting, but a few points should be discussed.

The first point is that high-quality CPR depends not only on muscle strength, as assessed in the index study, but also on many other influencing factors. One of these additional factors is body weight. Individuals with a high body weight may be able to exert more pressure on the resuscitation manikin than individuals with a more petite build.

The second point is that the tests used to assess muscle strength do not reflect the muscle groups that are particularly stressed during CPR. The muscles most stressed during CPR are those of the arms, chest, back, and shoulders. Grip function and thus hand strength are less critical for CPR. Therefore, measuring hand grip strength is not ideal for predicting high-quality CPR. Similarly, the curl-up test is not suitable for testing the muscle groups that are most used in CPR. The curl-up test mainly strengthens the abdominal muscles, which are less used in CPR.

The third point is that the quality of CPR also depends heavily on the motivation and attitude of the subjects performing the task. Were the participants paid to take part in the study, or was participation voluntary? Were there participants who disagreed with the study or were in conflict with the researchers?

The fourth point is that the quality of resuscitation also depends heavily on cardiopulmonary function and morbidity in general. How many of the subjects were smokers, drank alcohol, took illegal drugs, and how many had lung or heart disease? How many had rheumatic, orthopedic, psychiatric, endocrine, gastrointestinal, infectious respiratory, or heart disease at the time of the experiment? Subjects with asthma or heart failure, for example, may perform worse than subjects without these conditions.

The fifth point is that the subjects' current medication was not included in the assessment. People who take medications such as antiepileptics, antidepressants, anxiolytics, antipsychotics, or thyroid hormones may perform worse than people who do not take medication. Analgesics can also reduce muscle strength. Medications that cause metabolic acidosis, especially medications that increase serum lactate levels, such as metformin, albuterol, salbutamol, linezolid, acetaminophen, NRTI, and valproate, may cause exercise intolerance.

The sixth point is that CPR performance depends not only on readily available muscle strength, but also on endurance. Endurance itself is determined by important physiological factors such as VO2 max, a measure of oxygen consumption; lactate threshold, a measure of metabolic efficiency; and the economy of physical activity; stress; optimal nutrition; proper body composition; and environmental conditions, all of which contribute to maintaining energy production and delaying fatigue during prolonged activity.

Overall, the quality of CPR depends not only on muscle strength, but also on numerous other factors that must be considered when predicting the effectiveness of CPR.

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