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Variable Height Step Test Provides Reliable Heart Rate Response: Virtual Cardiorespiratory Testing During COVID-19 Pandemic

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Heart rate (HR) responses to aerobic step tests are widely used to estimate cardiorespiratory fitness. However, all available step tests require a prescribed step height, and cannot be done in the home without a standardized aerobic step. Amid the COVID-19 pandemic, it has been difficult for fitness professionals to provide standard aerobic steps to their clients. **PURPOSE:** To examine a modification on a standard step test allowing for the use of pre-existing in-home steps of variable height for cardiorespiratory fitness testing. **METHODS:** 15 healthy subjects (age 26 ± 6 yrs; M 6, W 9) met with researchers using virtual conferencing software to perform step tests on three occasions (1 familiarization visit, and 2 randomized data collection visits). Subjects identified and measured two steps/objects within the home that they could use for step testing. Subjects were asked to pick one small and one large object in their residence. Once the step was measured, the step frequency for each object was determined so that estimated exercising VO_2 would be matched between the step tests using the different objects. During each exercise visit subjects were asked to count their radial pulse manually for 1 min before and after a 3 min step test at an estimated intensity of 26 mL/kg/min. **RESULTS:** Post exercise HR's from the small step test 1 (familiarization visit) and small step test 2 (randomized visit) were highly correlated ($r=0.887$, $p<0.001$). The trend line slope ($m=1.031$) and y intercept ($b=0.540$) further suggest high interday repeatability. Post exercise HR from the small step test 2 vs large step test (randomized visits) were also highly correlated ($r=0.891$, $p<0.001$). The trend line slope ($m=0.960$) and y intercept ($b=1.095$) further suggest high repeatability of the exercise HR response despite different step heights and step frequencies between the tests. **CONCLUSION:** These preliminary results suggest that modifying step frequency to account for the varying heights of in-home steps will permit the use of previously developed step tests without the need for standardized steps. This study provides the first evidence that fitness professionals can use virtual step tests without specialized equipment to test cardiorespiratory fitness of their clients when close proximity is not possible.