A nomogram to select the optimal treadmill ramp protocol in subjects with high exercise capacity: validation and comparison with the Bruce protocol

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PURPOSE: Guidelines suggest that individualized ramp protocols with treadmill times targeted between 8 and 12 minutes are most suitable to estimate exercise capacity. However, previous methods to determine individualized ramp rates and comparisons between ramp and standardized protocols have been limited to clinically referred populations. METHODS: Forty-three healthy volunteers [median (interquartile range), age 36 (30-41) years; 10 women] performed an individualized ramp and a Bruce treadmill exercise protocol in random order. The Veterans Specific Activity Questionnaire [VSAQ, resulting in metabolic equivalents (METs)VSAQ] combined with a modified variant of the VSAQ nomogram (resulting in METs(NOMOGRAM)) was used to individualize the ramp protocol. Exercise capacity estimated from speed and grade of the treadmill (METs(ESTIMATED)) and that derived from directly measured peak oxygen uptake (VO2) [METs(MEASURED)] were compared with the pretest estimates of exercise capacity. RESULTS: Median values for METs(VSAQ), METs (NOMOGRAM), METs(ESTIMATED), and METs(MEASURED) for the ramp protocol were 12.0 (10-12), 15.0 (14-16.5), 16.7 (15.9-17.8), and 15.2 (13.5-16.7), respectively. For the ramp protocol, all 43 participants achieved a treadmill time between 8 and 12 minutes, whereas with the Bruce protocol only 6 (14%) participants fell within this range (P < .0001). Peak VO2 [ramp: 53.1 (47.4-58.3) versus Bruce: 53.5 (48.7-58.3) mL/kg/min; P = .008] was slightly lower using the ramp protocol. CONCLUSIONS: The modified variant of the VSAQ nomogram is a useful tool to estimate an individual's exercise capacity and to select a treadmill ramp protocol to yield the recommended exercise duration for moderately to highly fit, healthy individuals. The individualized ramp and the Bruce protocols are similar with regard to directly measured peak VO2 achieved.