1RM TESTING AS A VALID MEANS TO ASSESS LEG STRENGTH IN VIVO IN HUMANS

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In many situations, skeletal muscle strength is determined as a measure of functional capacity, either to evaluate the adaptive response to intervention programs or to compare muscle strength on an individual and/or population level. Though dynamometry is considered the gold standard for the assessment of muscle strength \textit{in vivo}, one repetition maximum (1RM) testing performed on training specific equipment is more commonly applied. The latter might be more appropriate in exercise intervention studies, because the training specific context of 1RM testing is considered to provide a more sensitive measure of the adaptive response. Similar to other strength assessment procedures, the validity of 1RM testing has been studied by comparison to dynamometer testing. However, the latter has generally been performed in small groups of mostly young subjects. In addition, most studies have limited their observations to upper extremity strength assessments. Because lower extremity strength is one of the most important factors affecting daily functioning and mobility, especially in elderly, we aimed to assess the validity of specific knee extension 1RM testing by comparison with dynamometry in a large heterogeneous population \((n=55, \text{age } 19-84 \text{ yr, BMI } 19-36 \text{ kg/m}^2)\). All subjects performed 1RM tests on regular leg extension (LE) and leg press (LP) equipment. Additionally, isometric and isokinetic \((120, 180, 240 \text{ and } 300 \text{ °/s})\) knee extension peak torques (PT’s) were determined on a Cybex-II dynamometer. Pearson’s \(r\) was calculated for the relations between 1RM data and PT’s for the entire population and for subgroups defined by age (young/old) and gender. 1RM muscle strength correlated strongly with dynamometer results. 1RM-LE correlated stronger with PT’s than 1RM-LP \((0.78 \leq r \leq 0.88 \text{ vs. } 0.72 \leq r \leq 0.77, \text{ respectively})\). The strongest correlations were found between 1RM-LE data and isometric PT, both for the entire group as well as within the various subgroups \((0.83 \leq r \leq 0.93)\). We conclude that 1RM testing represents a valid means to assess leg muscle strength \textit{in vivo} in young and elderly men and women. Considering the importance of training specificity in strength assessment, 1RM testing seems to be the preferred method to assess changes in leg muscle strength following exercise intervention.

\textit{Keywords: Skeletal Muscle, Training and Testing, Strength}

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