



Total load volume induces similar muscle hypertrophy and strength gain in aged rats undergoing resistance training and use of anabolic steroids

Krause Neto, W<sup>1.</sup>; Silva, W.A<sup>1.</sup>; Ciena, A.P<sup>3.</sup>; Bocalini, D<sup>2.</sup>; Nucci, R.A<sup>1.</sup>; Anaruma, C.A<sup>3.</sup>; Gama, E.F<sup>1.</sup>

<sup>1</sup>Department of Physical Education, Laboratory of Morphoquantitative Studies and Immunohistochemistry, São Judas Tadeu University, São Paulo-SP, Brazil

<sup>2</sup>Translational Physiology Laboratory, Physical Education and Aging Science Program, São Judas Tadeu University, São Paulo-SP, Brazil

<sup>3</sup>Department of Physical Education, Laboratory of Morphology and Physical Activity, São Paulo State University "Júlio de Mesquita Filho", Rio Claro-SP, Brazil

The sarcopenic process induces morphological, physiological and molecular changes that direct an exchange in the functional profile of the neuromuscular system of old populations. Resistance training and anabolic steroids are important strategies in controlling these parameters. Current interpretations indicate that control of total training volume is important in explaining outcomes such as strength gains and muscle hypertrophy in different conditions. However, we do not know whether such facts are true for experimental samples. This study aimed to quantify training parameters and analyze the morphological response of aged muscles submitted to resistance training and anabolic steroids. Aged Wistar rats (20 months-old) were divided into groups: C - initial control (n=6); CF - final control (n=6); CAS - control with anabolic steroid (n=6), RT - resistance training (n=6) and RTA - resistance training with anabolic steroid (n=6). All groups were submitted to adaptation, familiarization and maximum load carrying testing (MLCT). Resistance training (6-8x / session with progressive loads of 50 to 100% MLCT, 3x/week and pause of 120 seconds) was performed in ladder climbing equipment for 15 weeks. The administration of testosterone propionate (TP) was performed 2x/week (10 mg/kg) of the animal in the CAS and RTA groups at the same time of resistance training. After experimental period, animals were euthanized and soleus and plantaris muscle removed and prepared for histochemistry. To compare the groups we used one-way ANOVA (post hoc Tukey), student's t-tests for pre vs post (dependent and independent variables) comparisons and significance level set at  $p \leq 0.05$ . Maximum carried load, absolute and relative loads increased significantly in RT and RTA ( $p < 0.05$ ). RTA demonstrated greater relative load than RT ( $p < 0.05$ ). Average total volume, total climbing volume, relative total volume, relative total climbing volume and mean climbing volume were similar between groups RT e RTA. For soleus, CAS, RT and RTA enlarged cross-sectional area of type I fibers and nuclear ratio ( $p < 0.05$ ). As for type II fibers, RTA was higher than C and CF ( $p < 0.05$ ). RT and RTA showed significant increases compared to C and CF ( $p < 0.05$ ). For type II fibers, RTA showed a significant increase compared to C and CF ( $p < 0.05$ ). Regarding the nuclear ratio, RT and RTA showed a higher ratio than C, CF and CAS ( $p < 0.05$ ). Our results demonstrated that both RT and RTA were not different among the analyzed morphological parameters. This fact can be explained by the absence of differences found in the training variables analyzed.

Key words: androgenic anabolic steroids, strenght training, movement, elderly, morphology

E-mail: wild\_krause@hotmail.com