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Comparison of Perceived Exertion between Bodybuilders and Active Individuals in Different Exercises and Intensities

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ABSTRACT

Palumbo DP, Dias YR, Enes AN, Carneiro CF, Osiecki R. Comparison of Perceived Exertion between Bodybuilders and Active Individuals in Different Exercises and Intensities. **JEPonline** 2017; 20(5):29-35. The purpose of this present study was to compare the effect of different loading intensities on the psychophysiological response between bodybuilders and active individuals in resistance exercises for upper and lower limbs. Twelve male subjects were previously selected, of which 6 were bodybuilding athletes (B) (age = 31.17 ± 7.88 yrs old; body mass = 90.62 ± 6.41 kg; height = 171.35 ± 2.39 cm; %body fat = 10.12 ± 1.64) and 6 were active individuals (A) (age = 26.5 ± 6.5 yrs old; body mass = 84.03 ± 9.12 kg; height = 177.83 ± 6.39 cm; %body fat = 14.01 ± 5.44), for the performance on one-repetition maximum test (1RM) in the bench press and leg extension exercises. The subjects performed 2 sets of 5 reps for each of the above exercises at pre-defined relative intensities (40% and 80% of 1RM) with a 3-min interval between sets. Data from the perceptual responses were collected at the end of each set using the Borg CR100 Scale. Significant differences of RPE were found between the groups in the bench press exercise at 40% load (B = 30.17 ± 8.52 ; A = 40.50 ± 3.94) and 80% load (B = 75.33 ± 2.58 ; A = 84.83 ± 3.06) of 1RM, while in the leg extension exercise, significant differences were found between groups only in the 80% load (B = 77.50 ± 4.04 ; A = 83.17 ± 3.06) of 1RM. The findings indicate that no significant differences were found when comparing RPE between exercises. However, perceptual responses were different among the proposed intensities, showing that the training level interferes with the psychophysiological response to resistance training.

Key Words: Bodybuilding, Perceived Exertion, Resistance Training

INTRODUCTION

Resistance training (RT) has become a customary means to developing physical fitness and enhancing athletic performance. It is strength training characterized by exercises that improve muscle strength and endurance. Resistance training increases the number of motor units, whether it is adding weight by free weights or elastic bands. The stress imposed by RT results in specific physiological changes that are acute as well as chronic in the architecture of the muscle fibers (1,7).

The benefits of resistance training are sport-specific. Bodybuilders, in particular, are interested in high intensities with the purpose of acute stimulation of the muscular system. They not only want a stronger body, but also large muscles that result from activating metabolic signaling pathways that responsible for muscular hypertrophy (19). Bodybuilders can be characterized as the top of conditioning in resistance training, since the expectation of getting bigger, stronger, and leaner is considered the top priority in their lives (6). Due to their high level of training, it is necessary to have some means of measuring and controlling the training intensity.

The quantification of load and measurement of work can be carried out through the Borg Rating of Perceived Exertion Scale (RPE). It is a method that is supported by the literature (18) and also has validity in RT (9,12). The Borg RPE can be conceptualized as a means of quantifying the exertion perceived during exercise, whether it is the result of tension, physical exhaustion, discomfort or fatigue (16). Any one or a combination of these factors can elevate the subject's perceptual aspects during exercise. The work intensity reflects the neural activation during exercise, which is a function of the central motor control (5,14) that integrates afferent, peripheral, and central signals of the involved physiological systems (2,10,24). In particular, the increase in electromyographic signals is correlated with the subject's increase in RPE (12,13). From these findings of physiological responses to distinct stimuli, the CR-10, CR-100, RPE (3), and OMNI Scales (16) were created to quantify the intensity of the physical task.

As a result of the numbers of variables that can be manipulated (such as speed of the execution, load, rest, etc.) (8,21) to change the sensations of exertion in RT, the Borg RPE Scale is a viable method of measuring load that can present different responses according to the intensity and level of training of the population under analysis (23). But, since there is still a gap in the literature when referring to the population of bodybuilders, the purpose of this study was to compare the effect of different loading intensities on the psychophysiological response between bodybuilders and active individuals in exercises for upper and lower limbs.

METHODS

Subjects

The sample population was composed by 12 males that consisted of 6 bodybuilders (B) (age = $31,17 \pm 7,88$ yrs old; body mass = 90.62 ± 6.41 kg; height = 171.35 ± 2.39 cm; %body fat = 10.12 ± 1.64) who had already competed in official bodybuilding competitions and 6 active subjects (A) (age = 26.5 ± 6.5 yrs old; body mass = 84.03 ± 9.12 kg; height = 177.83 ± 6.39 cm; %body fat = 14.01 ± 5.44) who had a minimum of 24 months of experience with RT. All

subjects volunteered to participate in the study. No subject reported previous injuries or limitations that could interfere with the execution of the protocol.

Procedures

After the anthropometric assessment, the subjects performed the one-repetition maximum test (1RM) on the bench press and leg extension exercises following the recommendations of Brown and Weir (5). It was considered as the maximum load that which the subject performed, according to the orientation of execution, only one repetition of the requested exercise. The interval between trials ranged from 3 to 5 min and all the subjects reached their maximum load between the first and third trials.

The experimental protocol was composed of two sets of 5 reps for each of the exercises proposed in their relative intensities (40% and 80% of 1RM), which were done randomized of which the subjects where blind to the intensities they were submitted. A fixed interval of 3 min between sets was stipulated for all subjects. To obtain the rate of perceived exertion data at the end of each set, the Borg CR100 Scale was used (4).

Statistical Analyses

The normality of the data was tested using the Shapiro Wilk test. Once normality was accepted the data were expressed as average \pm standard deviation, and an ANOVA for two factors was applied to compare the averages of the groups in the different intensities and exercises. The level of significance was set at $P \leq 0.05$. All the data were processed by the statistical software SPSS version 20.0 (Armonk, NY / IBM Corp®).

RESULTS

The perceptive responses diverged between the groups of active individuals and bodybuilders both in the loads equivalent to 40% of 1RM and 80% of 1RM. Significant differences in RPE were found between groups in the bench press exercise at 40% and 80% loads of 1RM. However, in the leg extension exercise, a significant difference was found between groups only in the 80% load of 1RM. The results and averages can be observed in Table 1.

Table 1. Descriptive Values of Perceived Exertion for Bodybuilders and Active Individuals in the Exercises Bench Press and Leg Extension at 40% and 80% of 1RM.

	Bodybuilders		Active Individuals	
	Bench Press	Leg Extension	Bench press	Leg extension
40%	30.17 \pm 8.52*	31.33 \pm 7.28	40.50 \pm 3.94*	36.66 \pm 2.73
80%	75.33 \pm 2.58*	77.50 \pm 4.04*	84.83 \pm 3.06*	83.17 \pm 3.06*

*Statistical Difference between Groups ($P \leq 0.05$)

From a more general analysis, Figure 1 considers the perceptual responses of the subjects in the two exercises performed (bench press and leg extension) and presents the difference between the two groups studied. It can be noticed that the RPE reported by active individuals

is higher than that presented by bodybuilders in the two proposed intensities (40% of 1RM and 80% of 1RM). The perceptual results were also analyzed from the perspective of the exercise, where the RPE data of the active subjects were joined to the RPE data of the bodybuilders and subdivided into groups according to the exercise performed (Figure 2) and similar responses were obtained, so it is inferred that there is no significant difference in the perception of exertion between the execution of the bench press and leg extension exercises at the same percentage load in relation to the RM.

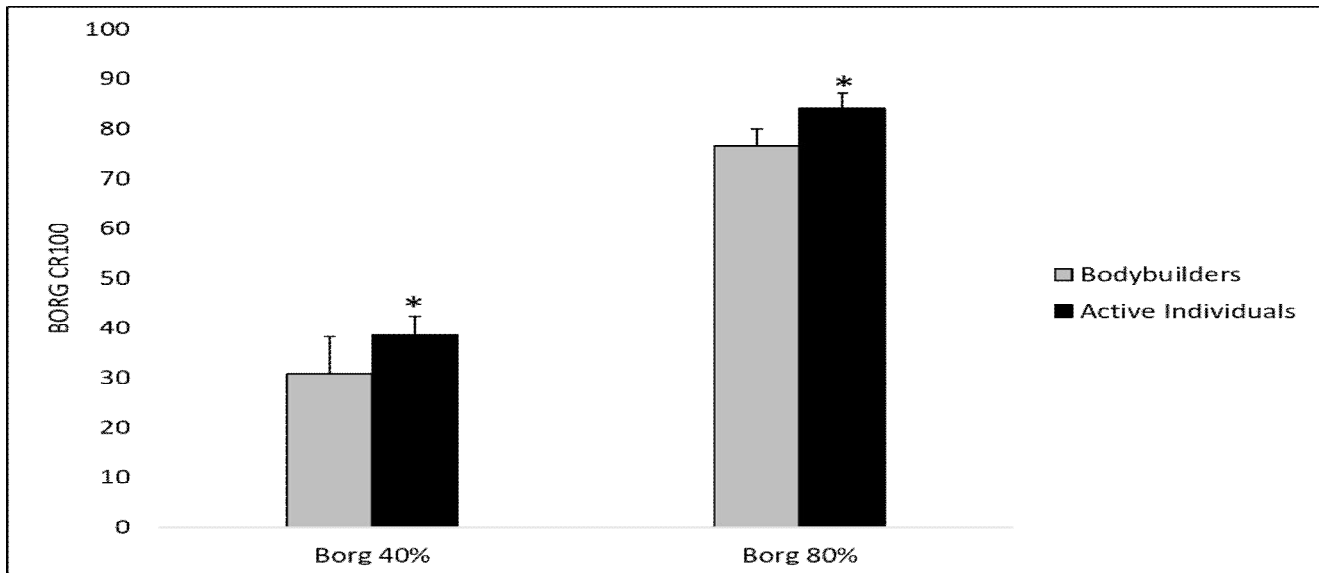


Figure 1. Interaction of Exercise and Borg CR100 Responses at 40% and 80% of 1RM for Bodybuilders and Active Individuals ($P < 0.001$).

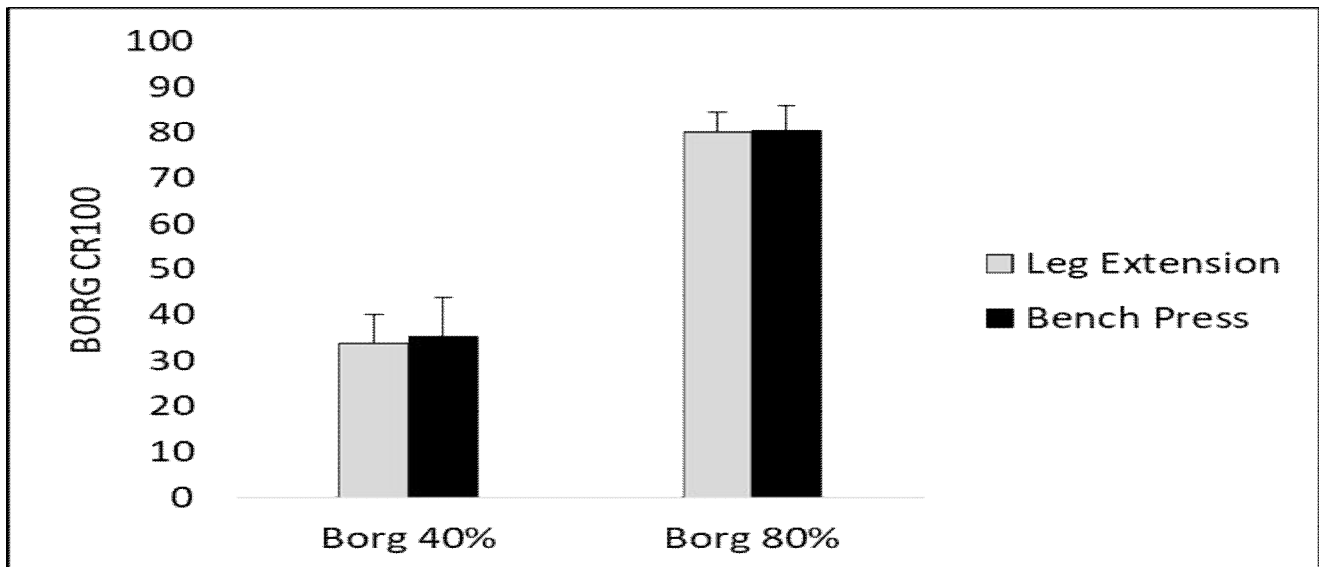


Figure 2. Interaction of Population and Borg CR 100 Responses at 40% and 80% of 1RM for Leg Extension and Bench Press Exercise ($P > 0.05$).

DISCUSSION

The present study obtained statistically significant differences in the intensities of 40% only in the bench press exercise and 80% in both exercises for the two populations analyzed. The study by Schoenfeld (20) assessed RPE by performing 10 repetitions in 7 different exercises, and concluded that in the highest intensity analyzed (70% of 1RM) the sample presented a greater perceptual response when compared to the lowest intensity analyzed (50% of 1RM). These differences were also found by Tiggemann et al. (23) who evaluated three groups at different levels of training (sedentary, active, and trained) in the leg press and bench press exercises. They concluded that the higher the level of training of the subjects, the greater will be the % of 1RM that supports the same perceptual response.

Among the results obtained in the present study, only the leg extension exercise at 40% intensity of 1RM did not present statistically significant difference. A similar result was found by Morree and colleagues (15) when analyzing the lower limbs. They did not find significant differences in the perceptual responses of men and women in the leg press exercise when performing 6 and 10 maximal repetitions. Also, in support of our results, the study by Tan (22) that compared men and women in the intensities of 50%, 70%, and 90% of 1RM did not find significant differences in the leg press and bench press exercises at the lower intensity. However, although they did not find significant difference in the leg press exercise for a higher intensity (90% of 1RM) either, the low intensity (50% of 1RM) showed a great variation in the perceptual responses that influenced the significant indifference in this intensity.

The results obtained in the present study that presented significant differences can be justified due to the different degree of training of the populations of the sample, which is in agreement with the study by Hampson et al. (11) where the authors concluded that the higher the level of training of the individual, the greater the capacity of tolerance to pain. Thus, the more trained the sample, the less will be the perceived exertion by the same.

CONCLUSIONS

The findings indicate that no significant differences were found when comparing the Borg RPE between the bench press and leg extension exercises. However, significant differences were found when comparing the two groups of subject analyzed in the accomplishment of the aforementioned exercises. The active subjects reported a greater perceptual response compared to the subjects who were bodybuilders at the same relative load.

Still, in the context of the load intensities of the tests, the two populations studied reported divergent RPE values for the intensities of 40% of 1RM and 80% of 1RM. In the exercise of the upper limbs, the difference found between the groups was significant for both loads. However, with regard to the lower limb exercise, this difference occurred only in the intensity of 80% of 1RM. As a result, it is reasonable to conclude that the results found in this study indicate that the level of training interferes with the RPE response in RT.

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