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Original Article

Do traditional and cluster-set resistance training systems alter the pleasure and effort perception in trained men?

GUSTAVO CÉSAR VASCONCELOS[1], BRUNA DANIELLA DE VASCONCELOS COSTA[2], IGOR RODRIGUES DAMORIM[3], TONY MEIRELES SANTOS[4], EDILSON SERPELONI CYRINO[5], DALTON DE LIMA-JUNIOR[6] AND LEONARDO SOUSA FORTES[7]
[1,2,3,4,,6]Department of Physical Education, Federal University of Pernambuco, BRAZIL
[5]Department of Physical Education, State University of Londrina, BRAZIL
[7]Department of Physical Education, Federal University of Paraíba, BRAZIL

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Abstract
Cluster-set training may decrease the rating of perceived exertion (RPE) responses during resistance training when compared to the traditional training. This decrease in RPE scores may influence the increase in pleasure levels associated with exercise without affecting the adaptive responses to training. Thus, the purpose of this study was to compare the effect of two different strength training methods (Traditional vs. Cluster-set) on pleasure and rating perceived exertion (RPE) in trained men. Twelve trained men (age = 23.0 ± 3.2 years, body mass = 72.5 ± 2.2 kg and % fat = 18 ± 6.4) completed all sessions. The participants performed two exercises (seated row and chest press) for the traditional and cluster-set methods. The participants performed between 8 and 10 repetitions with three sets for each exercise. Cluster-set was composed of 3 sets of 2 blocks with 20 seconds of rest between each of 4 repetitions. The RPE and pleasure responses were evaluated and compared before and between the sets and after 15 and 30 minutes of training (Cluster-set vs. Traditional). Repeated-measures ANOVA was used to compare the methods. No difference was found in the total work between the methods ($p = 0.979$). There was no significant difference for pleasure responses ($p = 0.253$). A difference in time was found for the RPE ($p = 0.001$). We concluded that men, who are experienced in strength training, did not exhibit differences in RPE and pleasure scores between traditional and cluster-set methods.
Keywords: Physical Activity; Perceptual Responses; Training System; Behavior; Strength Training

Introdution

Pleasure and displeasure is considered an important factor for the maintenance of the individual in the physical exercise programs (P. Ekkekakis, Hall, & Petruzzello, 2008; Rhodes & Kates, 2015). Regarding pleasure/displeasure responses, the dual-mode theory suggests that intensity is a determinant variable for the modulation of these responses, indicating the transition of ventilatory thresholds as the main factor for these changes (Panteleimon Ekkekakis, 2009). In this sense, high-intensity exercise was responsible for elevated ratings of perceived exertion (RPE), while the pleasure decreased when compared the moderate intensity (P. Ekkekakis et al., 2008). This finding confirms that manipulation of intensity can change the RPE as well as pleasure during exercise. Thus, this research had as independent variable the intensity manipulation in aerobic exercise (Panteleimon Ekkekakis, 2003; Panteleimon Ekkekakis, Lind, & Joens-Matre, 2006).

In resistance training the influence of intensity on the pleasure responses is inconclusive. It is observed that for trained men there is a significant decrease of pleasure in high-intensity training only when compared to the control condition, without exercise (Portugal, Lattari, Santos, & Deslandes, 2015). However, it is important to note that in addition to the intensity, the manipulation of other acute prescriptive variables in resistance training, as rest time between the series and/or repetitions, are able to attenuate the RPE (González-Hernádez et al., 2017; Hardee et al., 2012). When it comes to these individuals, it is quite common to incorporate these manipulations within the training routine, which result in the use of training systems (Fleck & Kraemer, 2017; Ribeiro et al., 2016). The systems are characterized by involving a variety of techniques that emphasize different resistance training variables, such as those mentioned above (Angleri, Ugrinowitsch, & Libardi, 2017).

The cluster-set training system is composed with the manipulation of the time using pauses during the repetitions, comprising small blocks, in a zone of repetitions (Tufano, Brown, & Haff, 2017). Unlike the cluster-set, the traditional training system is developed in zones of continuous repetitions for all the series in which the training is oriented, being able to take the individual close to the concentric fault (Kraemer & Ratamess, 2004). In this way, neuromuscular and perceptive responses are influenced for the different training systems (Mayo,

Corresponding Author: GUSTAVO CÉSAR VASCONCELOS, E-mail: gustav.cesar@hotmail.com

Iglesias-Soler, & Fernández-Del-Olmo, 2014). The cluster-set has shown to be responsible for decreasing the RPE during the training session when compared to the traditional training (González-Hernádez et al., 2017). A study carried out by Hardee et al. (2012) analyzed the influence of the interval between the repetitions on perceptual responses. The results indicated that the group that performed forty seconds of rest between the repetitions maintained the RPE scores lower when compared to the group that did not perform or those that were submitted to 20 s of interval (Hardee et al., 2012). These results were maintained even when the training variables (intensity x volume) did not change.

The low RPE scores during cluster-set are associated with the pause between repetitions (Hardee et al., 2013), which results in decreased metabolite concentrations for this type of training (Nicholson, Ispoglou, & Bissas, 2016). This direction may also influence the improvement of pleasure during the proposed activity (Alves et al., 2015) and may be an option that contributes to the maintenance or increase the intensity of training without impair the predetermined repetitions (Tufano et al., 2017). This additional pause between repetitions or between blocks might lead to maintenance of muscle strength, speed (Iglesias-Soler et al., 2012), and muscle power (Oliver et al., 2015) that are normally injured in the traditional training when the individual is brought to or near to the failure (Tufano et al., 2017).

Considering the above, it is noted that the cluster-set training might decrease the RPE responses during the resistance training when compared to the traditional. This decrease in RPE scores may possibly influence the increase in pleasure levels associated with exercise, without affecting the adaptive responses to training. In this case, aspects related to psychological responses seem to be important for decision making in physical exercise programs, especially for individuals who prefer to perform less intense training. Thus, the study aims to compare the effect of two different trainings (traditional vs. cluster-set) on pleasure and RPE. Our hypothesis is that for the cluster-set training, the RPE scores will be lower, while the pleasure will present larger scores in the cluster-set.

Methods

Participants

Twelve trained men were included in the study. The participants had experience in resistance training for at least six months. We included individuals who did not present a history of musculoskeletal injuries, which would make it impossible to perform the exercises; also, participants in use of psychoactive or ergogenic nutritional drugs that could interfere with the study were not able to participate in the study. Data were collected from self-declaration. Individuals who did not complete all visits were excluded. Participants were instructed to maintain their usual activities and maintain the diet during the tests. The research was approved by the Ethics Committee of the Health Sciences Center of the Federal University of Pernambuco.

Experimental design

This is an experimental cross-over study, in which the participants performed five visits. At the first visit, subjects were guided to all procedures and signed the Informed Consent Term, in addition the participants were familiarized with all the scales and the 10 RM test. On the second and third visit, the 10 RM test was replicated. On the fourth and fifth visit, in a random and counterbalanced way, using an excel spreadsheet. The individuals were submitted to two training systems (Traditional and Cluster-Set), and the total load volume was equalized. The pleasure and RPE scales were measured 15 seconds after the end and 15 s before each series.

Procedures

Anthropometric evaluation and body composition. The procedures followed the recommendations of the International Society for the Advancement of Kinanthropometry (ISAK) (2001). The measurements were body mass (kg - PL 200 portable scale, Filizola SA, São Paulo, Brazil, precision of 0.1 kg), stature (professional stadiometer Sanny, São Paulo, Brazil, accuracy of 0.1 cm) and three skinfolds (pectoral, abdominal and mid femoral), with measures of rotational form, evaluated three times, by a same evaluator and using the average of the measures for characterization of the participants, with subsequent calculation of the body density (Jackson & Pollock, 1978) and percentage of fat (Siri, 1961).

Strength Training Protocol. Participants underwent two exercises (seated row and chest press) for the traditional and cluster-set, performed an area of 8 to 10 repetitions, with three sets for each exercise. It was stipulated for each subject the correct form of execution of the exercise in the initial sessions. The visits took from two to seven days apart. Traditional training was composed by 3 sets of 8 to 10 repetitions with 120 seconds of rest between sets. The cluster-set was comprised by 3 sets of 2 blocks of 4 repetitions with 20 seconds of resting between repetitions and 100 seconds between sets. The two trainings were performed with 100% of 10 RM. It is worth mentioning that the training density was equalized.

Ten repetitions maximum (10-RM) test. The test was used to prescribe the training. The exercises performed were row-seated and chest press of the Matrix® (Idaiatuba, São Paulo – Brazil) brand. The familiarization of the 10 RM test was used to reduce the learning effect. All the participants were tested under the same conditions in the three 10 RM test sessions and the same position of the test was used during the trainings. The visits were divided in 48 hours periods. For each exercise, up to three attempts were made to test the 10 RM, in a circuit format with a 15 minutes interval between trials of the same exercise and 5 minutes for the different exercises.

To minimize the margin of error, the following instructions were adopted: standardization in relation to exercise technique and data collection; the individuals performed a specific warm-up at 50% of predicted 1 RM followed by two minutes of resting to begin the test. Participants received comments about their technique and were corrected when appropriate; additionally verbal encouragement was given during the training sessions. The repetitions were performed until the individual was unable to perform the complete movement (concentric action and eccentric action), according to the prior explanation of the evaluator.

Psychometric scales. The pleasure was evaluated through the feeling scale (FS) (Hardy, 1989). It is an 11-point scale, with single items, with a double polarity, ranging from +5 (very good) to -5 ("very bad"). The rating perceived exertion (RPE) was assessed by the CR10 scale (Borg & Borg, 2001). This instrument is composed of 11 points ranging from 0 ("minimum effort") to 10 ("maximum effort"). All the scales were applied up to 15 s after each series and 15 and 30 min following the end of the training to evaluate the perceived internal load.

Data analysis

The data were represented by mean and standard deviation. The Shapiro-Wilk test was conducted to test the normality of the data and Levene test to test the homoscedasticity. The Mauchly test was adopted to analyze the sphericity and, if this last assumption had been violated, we adopted the Greenhouse-Geisser correction. The reproducibility of the 10 RM test was analyzed by the intraclass correlation coefficient (ICC) using the results of the last attempts of each exercise for the second and third visit. Repeated-Measures two way ANOVA was used to analyze the interaction of the conditions (Cluster-set vs. Traditional) vs. moments (pre-experiment, between series and post-experiment) for the psychological scales scores (RPE and Pleasure). Post-hoc Bonferroni indicated the location of statistical differences. An independent samples t test was performed for the comparison of total work among trainings (Cluster-set vs. Traditional). All data were treated in SPSS v 21.0, adopting a significance level of 5%.

Results

Participants recruited were sixteen, four were not available to attend all sessions. Thus, the final sample included twelve trained men (age = 23.0 ±3.2 years, body mass = 72.5 ± 2.2 kg e % of fat = 18 ± 6.4). The total load volume (repetitions x kg) was similar for both conditions (3746.9 ± 454.7 e 3752.0 ± 457.6 for traditional and cluster-set, respectively; $t_{(20)} = 0.27$, $p = 0.979$). The intraclass correlation coefficient and coefficient of variance for 10 RM were (r = 0.99, 0.3%), respectively.

Pleasure. Figure 1 shows the pleasure results analyzed by repeated measures two-way ANOVA for both trainings (cluster-set vs. tradition). We did not find effects for moment ($F_{(8,88)} = 1.33$, $p = 0.283$) and condition ($F_{(1,11)} = 1,45$, $p = 0.253$). However, an interaction effect was observed for the interaction condition vs. moment ($F_{(8,88)} = 3.07$, $p = 0.026$). Bonferroni post-hoc test indicated an increase in pleasure score for the cluster set in the last set of the seated row ($p = 0.039$)

RPE. Figure 2 shows the RPE results analyzed by two-way repeated measures ANOVA for the conditions (cluster-set vs. tradition). We did not find effects of condition ($F_{(1, 11)} = 0.06$, $p = 0,939$). Data revealed main effect for moment ($F_{(8, 88)} = 34.67$, $p = 0.000$) with increase RPE during exercise. However, interaction effect was not found ($F_{(8, 88)} = 1,64$, $p = 0,209$).

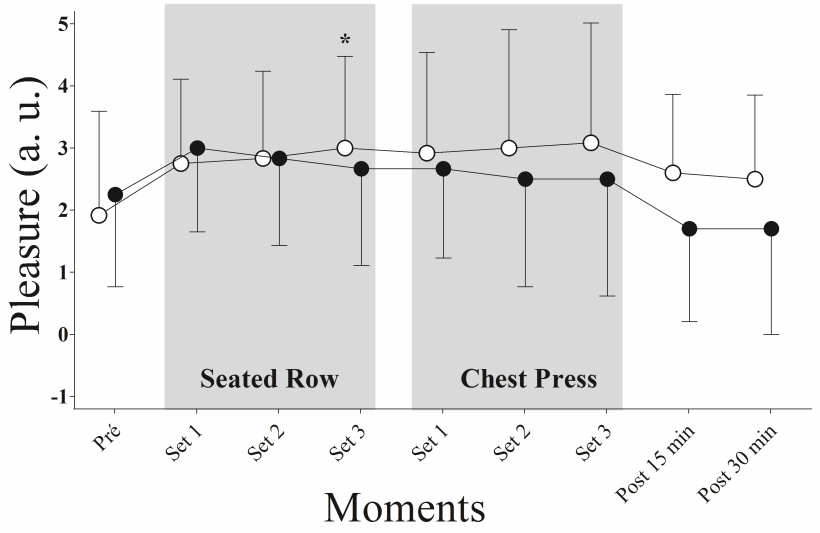

Fig 1. Comparison of pleasure responses in different training systems (*Cluster-set* vs. Traditional).
Note. RPE – rating perceived exertion, a.u – arbitrary unit

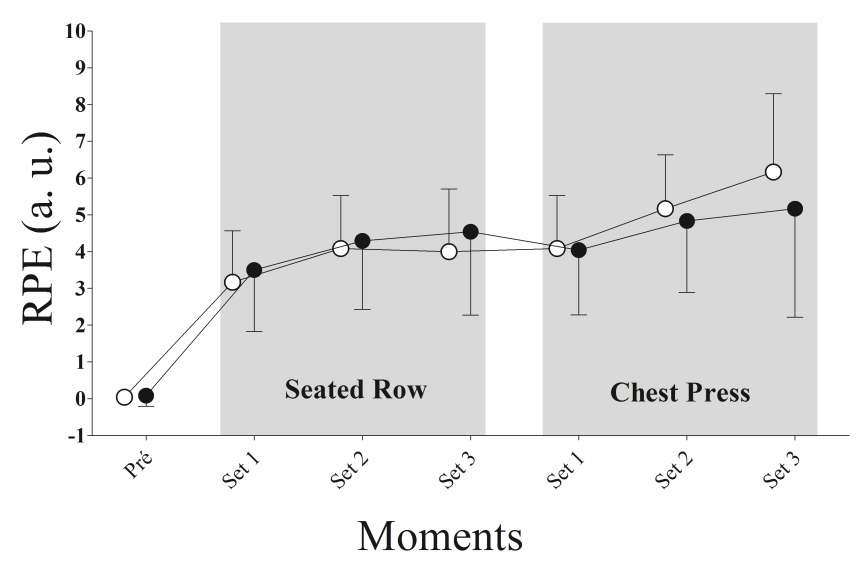

Fig 2. Comparison of RPE responses in different training systems (Cluster-set vs. Traditional).
Note. RPE – rating perceived exertion, a.u – arbitrary unit

Discussion

The present study compared the acute effect of two methods of resistance training (traditional vs. cluster-set) on pleasure responses and RPE during a RT session. The main results indicated similarity of pleasure and RPE among the trainings; there was no significant difference when the cluster-set was compared to the traditional training. Even pointing out to an interaction at moment 4, this result was not enough to accept our hypothesis that pleasure would increase as result of the lower RPE scores during the cluster-set.

It has been shown previously that the inclusion of interval between the repetitions seems to allow partial recovery of the exercise, more precisely intervals above 20s (Hardee et al., 2012). This phenomenon can be explained due to the depletion of phosphocreatine to increase the RPE (Dawson et al., 1997). However, partial recovery of this energetic route occurs at intervals above 30s, that is, recovery of phosphocreatine values occur only about 54%, compared to a superior resting levels (Dawson et al., 1997). However, as this measure has not been evaluated, this conclusion should be treated with caution.

In this sense, the non-significant results of the RPE when comparing the trainings might be explained because the interval between the repetitions was not enough to decrease the residual fatigue. Similarly, Hardee et al. (2012) analyzed RPE behavior in different interval configurations (0s, 20s, and 40s) and found smaller RPE scores in the 40s condition, with a significant difference when compared to the other experimental conditions. The configuration adopted in the present study, for trained individuals, the RPE response seems to be independent of the choice of resistance training method. Equalization of total work may also have influenced similar RPE responses. Since, previous studies have reported a direct link between total work and RPE scores (Pritchett, Green, Wickwire, & Kovacs, 2009). Therefore, the decision-making of resistance training practitioners on the choice of the method may depend on other factors, including the practitioner's preference.

Regarding pleasure during exercise, there was no significant difference when compared the methods. The results were similar in comparison to the times. It is important to note that the pleasure scores remained positive throughout the two experimental conditions. These findings can be explained as the intensity of the training sessions has been perceived as moderated by practitioners. Studies that examined the behavior of the pleasure in the resistance training found that the affective responses were positive after a training session in moderate intensity when compared to those in low and high intensity (Arent, 2004; Bellezza, Hall, Miller, & Bixby, 2009). These results are consistent with findings from the current study, as the mean intensity of training sessions were considered moderate.

In addition to intensity, the type of exercise can also influence pleasure responses. Previous investigations have suggested that greater magnitude of pleasure is achieved according to the preference of the type of exercise (Portugal et al., 2015). Portugal et al. (2015) revealed that individuals who showed decreased pleasure in resisted lower limb exercises indicated a non-preference for performing them, resulting in decreased pleasure sensation. In this sense, it seems that pleasure may be related to the type and choice of exercises. Therefore, considering that the pleasure of performing an exercise is related to the adherence to this training program, the preference for performing an activity is a factor that must be prioritized. However, the participants of this study were individuals already enrolled in a resistance training program. Therefore, the relationship between the sensation of pleasure and the preference of the type of exercise is clear.

To our knowledge, this is the first study that analyzed the acute responses of pleasure and RPE in two different methods (traditional vs. cluster-set). In addition, there are still few studies that analyzed the pleasure responses in the RT and most of them investigated the effect of the intensity of the training on this variable (Benites, Alves, Ferreira, Follador, & da Silva, 2016; Elsangedy, Krinski, da Silva Machado, Okano, & da Silva, 2016; Portugal et al., 2015). However, the configuration of different trainings, due to the manipulation of other acute training variables, besides the intensity, might modify the psychophysiological responses during the resistance training, more specifically, the rest interval. However, the range adopted in our study was not sufficient to significantly alter these responses. In this sense, future scientific investigations are necessary, with the manipulation of different rest intervals between repetitions and different exercises.

Limitations should be considered in our study. The results of the comparison of the methods (traditional vs. cluster-set) on pleasure and RPE were of acute characteristic. The effect of this long-term pattern of configuration for men experienced in resistance training is not yet known. Finally, future studies on pleasure and resistance training methods are necessary, since pleasure responses influenced by other factors, such as mood and preference for the type of exercise (Bellezza et al., 2009). In addition, the individual variation of the pleasure responses in the strength training is not yet elucidated.

Conclusion

It is possible to conclude that for experienced man in strength training, cluster-set and traditional training was not enough to significantly modify RPE and pleasure scores. Most likely these results can be explained by the administration of the exercise variables having been equalized. We believe that increasing the pause between repetitions in the cluster-set could decrease RPE and improve outcomes on pleasure responses.

Conflicts of interest: the authors have any conflicts of interest to declare.

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