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# Effect of combined training on ratings of perceived exertion and sensation of pleasure/displeasure in obese women

## *O efeito do treinamento combinado sobre a percepção subjetiva do esforço e sensação de prazer/desprazer em mulheres obesas*

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**Abstract** – Self-selected intensities during walking and resistances training by obese subjects are below recommended guidelines to improve health-related outcomes. From this perspective, there is the possibility of combining both aerobic and resistance training in a single exercise session with the purpose of increasing training volume and optimizing physiological adaptations, while preserving positive affective responses. Until now, no study has assessed ratings of perceived exertion (RPE) and sensations of pleasure/displeasure (SPD) during a combined training session in obese women. The present study aimed to: (1) assess RPE and SPD during a combined training session in obese women; and (2) compare RPE and SPD responses during different resistance training exercises. Twelve sedentary obese women (age: 39.2 ±11.1 years; height: 160.4 ± 5.9 cm; body mass: 87.4 ± 5.8 kg; BMI: 33.6 ±1.2 kg.m$^{-2}$) performed a combined aerobic and resistance training session. RPE and SPD were recorded during the session. Data were analyzed with One-way repeated measures ANOVA and Bonferroni's post hoc tests. The results revealed that, despite the increase in exercise volume, RPE responses were low and affective responses were positive. There were no significant differences in RPE and SPD values among resistance exercises. Combined aerobic and resistance training can be prescribed during the initial phase of a training program because it produces low perceived exertion and positive affective responses.

**Key words**: Affect; Physical exercises; Perceived exertion

**Resumo** – *As intensidades autosselecionadas observadas tanto na caminhada como no treinamento resistido em obesos são inferiores as recomendações do ACSM, (2011) as quais, promovem melhora na aptidão cardiorrespiratória e força muscular. A partir disso, surge a hipótese de combinar os exercícios, aeróbio e resistido em uma única sessão com o intuito de aumentar o volume de treinamento otimizando os ajustes fisiológicos tentando preservar baixos níveis de percepção subjetiva do esforço (PSE) e sensações prazerosas (SPD) observadas nessa intensidade. Desta maneira, o presente estudo teve três objetivos: 1) verificar ao longo de uma sessão de treinamento combinado a PSE e a SPD em mulheres obesas; 2) analisar se ocorrerá alteração na PSE e SPD entre os diferentes exercícios resistidos; 3) investigar se existe correlação entre a PSE e SPD. Participaram doze mulheres obesas não praticantes de exercício físico com idades de 39.2±11.1 anos e IMC: 33.6±1.2 kg.m$^{-2}$ as quais, foram submetidas a uma sessão de treinamento combinado com duração total de 60 minutos. Ao longo da sessão foram reportadas a PSE e SPD. Para analisar os dados foi utilizado uma ANOVA de medidas repetidas seguido de um Post Hock de Bonferroni. Os resultados demonstram que o volume aumentado produziu baixos valores de PSE (~3) e sensações prazerosas (~3) ao longo da sessão. Não foi encontrado diferença significativa da PSE e SPD entre os exercícios resistidos e foi evidenciada uma relação negativa moderada significativa (r= -0.624; p= 0.001 com 95% IC: -0.710; -0.280) entre a PSE e SPD. Sendo assim, o treinamento combinado pode ser prescrito para mulheres obesas, pois, produz baixa percepção de esforço e sensações prazerosas.*

**Palavras-chave**: *Afeto; Exercício físico; Percepção subjetiva do esforço.*

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## INTRODUCTION

Obesity is considered a chronic non-communicable disease (CNCD), since it predisposes individuals to the development of hypertension, type II diabetes, dyslipidemia, among other disorders[1]. These are risk factors for cardiovascular disorders which are known to be the leading causes of death and morbidity in adults. Data have shown a high prevalence of obesity in Brazil, where about 15.8% of the population are in this condition, of which 44.7% are women[2]. Specifically, in the city of Curitiba located in the state of Paraná, 13.5% of women are obese[2]. This scenario is considered an important public health problem, and the scientific community has sought to investigate effective strategies in the treatment and prevention of obesity.

Physical exercise is presented as a promising measure due to the physiological adjustments provided in the anthropometric, metabolic and cardiovascular fitness parameters[3-5]. For example, the practice of aerobic exercise with prescribed intensity of 60-70% of $VO_2$max improves cholesterol, high-density lipoprotein, triglycerides, cardiac function levels and reduces body weight[6]. Resistance exercise demonstrates similar results with prescriptions of 2-3 series of 15-10 repetitions with load percentage of 60-70% of one repetition maximal (1RM)[5]. Despite the positive effect on health, obese individuals have high dropout rates in exercise programs[6]. Studies point to some justifications for this phenomenon, one of them is the reduced self-efficacy and the depreciated motivational state[7,8]. However, the main reason is linked to the negative experience in the practice of physical exercise associated to intensities prescribed according to guidelines of the American College of Sports Medicine [9]. The recommendation for beginners to achieve beneficial organic modifications is to practice aerobic exercises at intensities of 60-85% of $VO_2$max or resistance exercises at 60% -70% of 1RM. Although these intensities provide benefits, they also promote high ratings of perceived exertion (RPE), modulating the sensation to displeasure in a large part of individuals, generating a negative record of the situation[7,10]. This displeasure sensation associated with lower motivation levels and reduced self-efficacy observed in obese individuals significantly contribute to the high dropout rates of physical exercise programs[11]. From this perspective, a method that takes into account individual preferences in the prescription of exercise intensity has been used, known as self-selected intensity[12].

Dishman[8] showed that low RPE and pleasurable sensations during self-selected exercise decrease dropout rates in detriment to the high prescribed intensities. It should be noted that other factors are also identified as influencing dropout rates in different physical exercise programs, such as socioeconomic condition, little time available and difficult access to a place for practice. However, a recent systematic review indicated that adherence is more related to pleasurable sensations experienced during physical exercise from mild to moderate intensity[13]. Thus, the self-selection method became an important strategy to create a positive motivational stimulus for obese individuals during the practice of exercise[14]. However, previous studies

have investigated treadmill walking for 20 'to 30' minutes at self-selected intensity and identified that the workload was ~ 38% of $VO_2$max, i.e., below values proposed for health benefits[14,15]. The findings for resistance exercise are similar, presenting load ~ 40% of 1RM for 3 series of 10 repetitions[16,17], which was not compatible with health benefit recommendations. Probably, these stimuli would not be enough to promote significant physiological adjustments in $VO_2$max, muscle strength and body fat reduction.

In view of the above, the combination of resistance and aerobic exercises in a single session with the intention of increasing the training volume, both in self-selected intensity, has been proposed. The increased volume may perhaps promote greater energy consumption, and consequently could provide higher health benefits. However, Kilpatrick[18] demonstrated that RPE tends to fluctuate throughout the exercise despite little or no change in self-selected intensity. The authors observed an increase in progressive RPE during walking at intensity that corresponded to the light domain, indicating that perceived exertion would be associated with exercise duration. In this way, increasing the training session volume combining resistance and aerobic exercises could lead to high RPE possibly promoting unpleasant sensations, mainly in obese individuals. However, the perceptual response and sensations of pleasure/displeasure (SPD) produced under this condition for this population are not yet known. Such information may significantly contribute to initial prescriptions in exercise programs possibly increasing adherence levels and decreasing dropout rates along with the possibility of significant physiological adjustments in obese individuals. Therefore, the present study had three objectives: 1) to verify, during a combined training session, RPE and SPD in obese women; 2) analyze whether there will be changes in RPE and SPD in different resistance exercises; 3) investigate whether there is correlation between RPE and SPD.

## METHODOLOGICAL PROCEDURES

### Subjects

The present study included 12 obese women (BMI: 33.2 ± 1.1 $kg.m^{-2}$) aged 35-40 years not involved in the practice physical exercises (Table 1). Participants were recruited by convenience method, which was developed in stages: (1) mapping of possible locations where the target population could be found; (2) visits to community groups, explanation of research procedures and invitation to volunteer participation in the study; (3) fixation of posters on public places inviting the target population to take part in the study on a voluntary basis.

All participants should be in accordance with the adopted criteria, including: (a) premenopausal condition; (b) presence of negative responses in all items of the Physical Activity Readiness Questionnaire (PAR-Q); (c) self-report of non-smoking; (d) BMI consistent to obesity grade I[1] (≥ 30 kg.m -2 to ≤ 34 kg.m -2); exclusion: (a) presence of joint, neurological, cardiovascular or respiratory limitations that affect walking mechanics

and / or resistance training; (b) use of medications that affect exercise responses; (c) self-report of changes in habits related to physical exercise in the six months prior to the beginning of evaluations; (d) self-report of contraindication to high intensity physical exercise, based on medical examinations performed within the 12 months prior to the beginning of evaluations; (e) self-reported diagnosis of polycystic ovary. All participation was voluntary and each participant completed the Informed Consent Form (ICF). The present study was approved by the Ethics Committee of the Federal University of Paraná, CAAE: 39396914.8.0000.0102. To estimate the sample size, an analysis was conducted in the G * Power 3.1 software using parameters for F family test (ANOVA). The values adopted for the calculation were borderline power of 0.80 with *Alfa* = 0.05 and effect size of 0.34 that resulted in n = 12.

## Experimental design

The research had a cross-sectional design and was characterized as pre-experimental, therefore, submitted the study object to the influence of certain conditions controlled by researchers without a control group. The independent variable is the combined training (CT), and the dependent variables are RPE and sensations of pleasure/displeasure and workload is the control variable.

Participants completed five meetings, separated by a 48-hour interval between them: (1) body composition was evaluated at the laboratory of physiology of the Federal University of Paraná, completed the ICF, PAR-Q questionnaire and the questions regarding the inclusion / exclusion criteria, which were cataloged and stored; (2) participants performed a maximal oxygen uptake test ($VO_2$max); (3) performed a familiarization session with resistance exercises and one repetition maximal (1RM) was sequentially tested; (4) they repeated the 1RM test; (5) performed the combined training, which consisted of 30 minutes of treadmill walking followed by five resistance exercises, both at self-selected intensity. The performance of resistance exercises was alternated by muscle segment, upper and lower limbs (bench press, leg extension machine, lat pull down, leg curl and biceps curl). During the session, RPE and feelings of pleasure/displeasure (FPD) measurements were reported.

## Body Composition Assessment

Body composition evaluation consisted of body mass (BM) and height (HEI) for determination of body mass index (BMI). BM measurement was performed on a scale (Toledo®, model 2096, São Paulo, Brazil) with accuracy of 0.1 kg. The participant stood on the center of the scale, with her back to the scale in anatomical position, with body mass equally distributed over both feet, and the arms remaining loose along the trunk. HEI, in centimeters, was measured in a stadiometer (Sanny®) fixed to the wall (Standard model, São Bernardo do Campo, Brazil), staggered at 0.1 cm, and defined as the corresponding distance between the plantar region

and the vertex formed by the device cursor placed at the highest point of the head with the participant in inspiratory apnea. BMI was calculated by the ratio between BM and squared HEI (BMI = kg / $m^2$).

## $VO_2$max test

$VO_2$max was determined by means of a maximal incremental test of voluntary exhaustion using a computerized spirometry system (Cosmed K4b2, Rome, Italy). Participants, on this day, initially received specific instructions on the interpretation of the OMNI WALKING scale (0-10). The methodology used for scale anchoring followed procedures proposed by Robertson et al.,[19].

At the end of explanations, participants performed a brief familiarization walking in the treadmill for five minutes at low speed considered standard of 1.11 $m.s^{-1}$ (4.0 $k.m^{-1}$) without slope, wearing the gas analyzer apparatuses. The Bruce protocol was performed, consisting of 10 stages of three minutes each, varying the treadmill slope and speed in a continuous and progressive manner. $VO_2$max was operationally defined as the mean oxygen uptake value ($O_2$) in the last complete stage of the maximal treadmill incremental test[20].

## Familiarization with resistance exercises

In order to facilitate the testing of load and experimental procedures, participants performed a familiarization session. Firstly, bench press, leg extension machine, lat pull down, leg curl and biceps curl exercises were performed with simultaneous verbal instructions, then the participant performed the same action with minimum load in order to allow better execution and understanding. In addition, they were instructed to use constant speed of movement in both concentric and eccentric action (2:2s). The choice of exercises was based on the inclusion of large muscle groups following the concept of large muscular loops, pushing, pulling and using power with the lower limbs. The routine order was alternated by segment due to the low physical conditioning of participants, which would minimize the local muscular fatigue, facilitating the execution of the complete routine. This proposal is in accordance with ACSM guidelines[9].

During the familiarization process, participants were oriented on the use of the OMNI-RES scale (0-10) and also on the correct interpretation of the SPD scale. The explanation of the SPD scale, which has a bipolar classification of 11 points, ranging from +5 to -5, with an anchor of zero (neutral) and in all odd integers, from "very good" (+5) to "very poor "(-5), followed method recommended by Hardy and Rejeski[21].

## 1 RM test

Maximum muscle strength was determined using one repetition maximal test (1RM), according to procedures of Baechle and Earle[22]. The test started with specific joint warm-up composed of 3 sets of 10 light-load repetitions[22]. 1RM was determined only for supine and leg extension exercises. These

exercises were chosen to quantify 1RM because they are basic exercises that carry greater load and allow a more precise determination on the execution of the movement under this condition. In addition, they enable performing a safer test, where the researcher can also offer better technical support in the case of failure or unforeseen event.

Participants were instructed to lift the load only once. After the movement was completed, the load was increased and another attempt was made after 3 minutes of rest. The same procedure was repeated until participant was no longer able to lift the load with the appropriate technique. The last load used with the execution of the appropriate movement technique was recorded as the 1RM value.

## Load self-selection

The procedure adopted for treadmill load self-selection was the speed that the participant judged adequate for the stipulated duration, 30 minutes of walking. The instruction to participants followed the protocol suggested by Utter et al.[23]:

- "Please, we would like you to select the speed that you think is preferred for performing the selected aerobic exercise" ... "This speed should be the one you feel appropriate for you".
- For each of the resistance exercises, before the beginning of series, the participant had up to 3 attempts in order to determine the appropriate load for the accomplishment of the 3 series of 10 repetitions. For this to occur, they received instruction according to procedure proposed by Ratamess et al.[24]:
- "How much weight would you select in this exercise to perform 3 series of 10 repetitions?" The test consists of the performance of only three movements with the self-selected load. Upon obtaining load, 1 minute of interval was given and then the exercise was performed in full.

## Training Session

The training routine started with five minutes of warm-up on the treadmill, then, participants self-selected the intensity in which they would like to walk for thirty minutes. In addition, they were advised that during this period, they could increase or decrease intensity according to their preference. RPE and SPD were monitored every five minutes. After the walking session, participants performed resistance exercises, which were performed in a defined order: bench press, leg extension machine, lat pull down, leg curl and biceps curl. The rest interval between exercise series and transitions was 1 minute and at that time, RPE and SPD were reported. To ensure the correct execution of movements, participants were supervised throughout the session by two experienced instructors.

## Ratings of Perceived Exertion and Sensation Scale

RPE was measured every five minutes on the treadmill and each interval be-

tween series in resistance exercises (traditional measurement). The scale was presented to participants, who were asked to answer the following question, "Which effort level did you feel in your body at this time?" The instruction was to consider only the perception of that moment. The procedure used in the pleasure / displeasure sensation scale was similar, only differing regarding the question asked: "What is your sensation at this moment?"

### Statistical analysis

Data were tabulated and stored on a database developed in the Microsoft Office Access 2003 software. All data were analyzed in the Statistical Package for Social Sciences (SPSS, version 18.0) for Windows, with significance level stipulated at $p < 0.05$ for all analyses. First, data distribution normality was confirmed by the Shapiro-Wilk test, then, a paired t-test was used to test the homogeneity of 1RM loads. Descriptive statistics were used to present the characterization of study participants, with measures of central tendency and variability (mean and standard deviation). Analysis of variance (ANOVA) of repeated measures, together with the Bonferroni multiple comparison test, to identify possible differences. Data sphericity was verified by the Mauchly test, followed by the Greenhouse-Gesseir correction if assumptions were violated. Additionally, to verify RPE and SPD responses throughout the training, the session was divided into percentages. The complete training session was established as one hundred percent (100%) corresponding to 60 minutes and from that value, its fractions were stipulated which were: 15% (10'); 25% (15'); 75% (45 ') and 100% (60'). These fractions were compared to each other by analysis of variance (ANOVA) of repeated measurements. Finally, Pearson's correlation was performed between RPE and SPD. Sample size was obtained through analysis in the G * Power 3.1 software using parameters for the F family test (ANOVA). The values adopted for the calculation were borderline power of 0.80 with *Alfa* = 0.05 and effect size of 0.34.

## RESULTS

The t test did not present significant difference ($t_{(11)} = 2.76$, $p = 0.11$) in bench press, leg extension machine in the comparison among 1RMs for the different moments, indicating load homogeneity.

Statistical analysis showed no significant difference ($F_{(4.56)} = 0.289$, $p = 0.687$) for RPE and SPD among resistance exercises (Table 2) and at different times during walking (Figure 1).

In time fractions that represent moments of the training session (15% (10'), 25% (15'), 75% (45') and 100% (60'), no significant changes were found ($F_{(3.44)} = 0.392$, $p = 0.723$) in RPE and SPD (Figure 2). RPE presented an average of 3.2 ± 1.0, which on the scale represents that the task was between "easy" and "something easy". The average feeling was 2.0 ± 1.2 on the scale, rated as "good", that is, pleasure.

**Table 1.** General characteristics of participants and the reproducibility of loads (kg) of 1RM presented as mean and standard deviation.

| Participants | M ± SD | M ± SD |
|---|---|---|
| Age (years) | 31.1 ± 10.5 | --- |
| BMI (kg.m$^{-2}$) | 33.2 ± 1.1 | --- |
| VO2max (ml/kg/min) | 23.4 ± 3.2 | --- |
| 1RM Bench press (kg) | 30.2 ± 8.5 | 30.3 ± 6.7 |
| 1RM Leg extension machine (kg) | 84.1 ± 15.2 | 84.1 ± 14.4 |

BMI: Body mass index; M: mean; ± SD: standard deviation. * Significant difference ($p < 0.05$).

**Table 2.** RPE and SPD responses and self-selected loads (kg) during the performance of resistance exercises

| Resistance Exercises | RPE | SPD | Self-selected load (kg) |
|---|---|---|---|
| Bench press | 3.7 ± 1.4 | 1.5 ± 1.3 | 10.6 ± 4.1 |
| Leg extension machine | 3.4 ± 1.0 | 2.4 ± 1.1 | 29.5 ± 12.4 |
| Lat pull down | 3.9 ± 0.7 | 1.8 ± 1.8 | 19.8 ± 6.1 |
| Leg curl | 3.0 ± 1.0 | 2.0 ± 1.3 | 15.6 ± 7.1 |
| Biceps curl | 3.5 ± 1.1 | 1.9 ± 1.8 | 8.4 ± 1.9 |

RPE: rating of perceived effort; SPD: sensation of pleasure / displeasure. * Significant difference ($p < 0.05$).

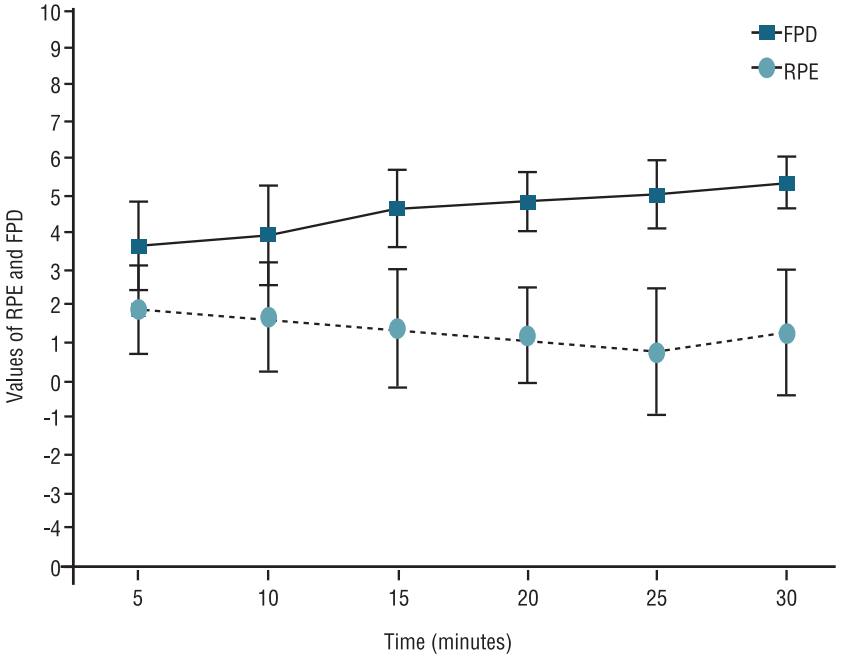


**Figure 1.** RPE and SPD responses during treadmill walking at self-selected intensity obtained every 5 minutes. RPE: rating of perceived effort; SPD: sensation of pleasure / displeasure.

Pearson's correlation showed a significant moderate negative relation ($r$ = -0.624; p = 0.0001 with 95% CI: -0.710; -0.280) between RPE and SPD. This negative relation is clearly shown in figure 3, in which the overall mean of RPE and SPD of each participant was plotted.

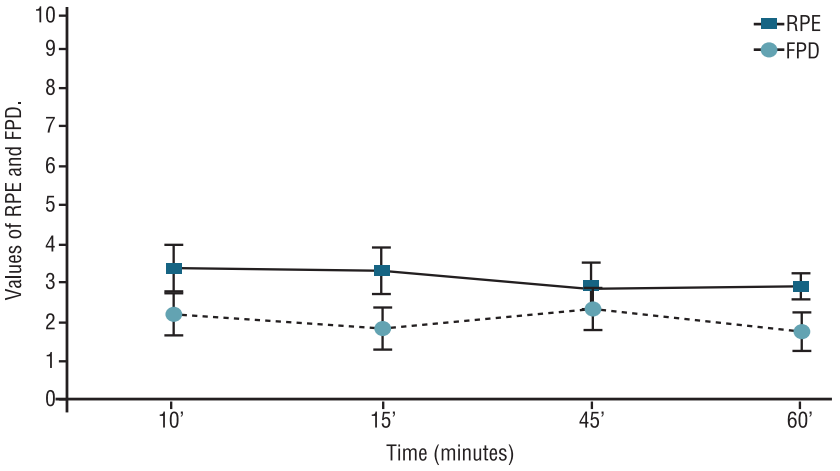


**Figure 2.** RPE and FPD responses regarding the percentages stipulated for the different moments of the combined training session. 15% (10 '); 25% (15 '); 75% (45') and 100% (60')/

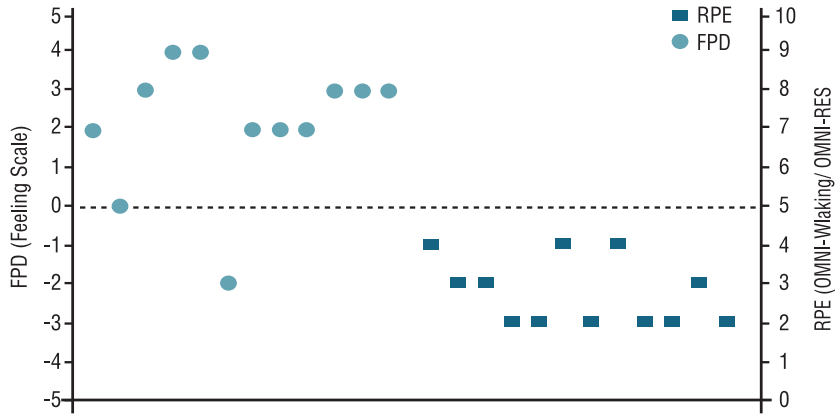


**Figure 3.** Overall rating of perceived effort (RPE) and sensation of pleasure / displeasure (FPD) values of the combined training

## DISCUSSION

The research had three objectives: 1) to verify RPE and SPD in obese women throughout a combined training session; 2) to analyze if there was alteration in RPE and SPD among the different resistance exercises; 3) to investigate the correlation between RPE and SPD. The findings of the present study supported the hypothesis, demonstrating low RPE values, as well as pleasurable sensations from the beginning to the end of the exercise session, indicating that the training volume did not negatively affect variables (Figure 1). No significant difference was found for RPE and SPD among resistance exercises. Self-selected loads both on walking and on resistance exercises were below values recommended by ACSM[9] to obtain significant physiological adjustments. In bench press and leg extension machine, loads were ~ 33% and ~ 35% of 1RM, respectively, and in the walking session, they remained all time below ventilatory threshold (~ 45% of $VO_2$max), with speed of 4.2 km / h.

The present study is the first to investigate RPE and SPD in combined training. Nevertheless, the RPE and SPD responses were consistent with

previous studies that examined these conditions separately. Alves et al.[25] conducted a resistance training session at self-selected intensity with obese subjects and observed load of ~ 40% of 1RM in the bench press, a reduced perceived effort and pleasurable sensations. Regarding self-selected intensity walking, research has identified that speed remains below ventilatory threshold throughout the experiment, producing low effort and pleasurable sensations[26]. This demonstrates that individuals do not implement the workload during exercise, that is, they tend to maintain intensities in the light domain, and consequently obtaining reduced energy expenditure (EE). This fact was verified during a 20-minute walk test at self-selected intensity in obese, overweight and normal weight individuals[27]. The investigation showed that obese individuals had relative EE of 1.8 ± 0.4 kcal. $kg^{-1}$ per minute. In the total of 20 minutes exercising, they consumed on average only 133.4 ± 35.1 kcal.$kg^{-1}$, which is insufficient to reduce body mass. Freitas et al. [26] confirmed this hypothesis by comparing the effect of thirty-six sessions of self-selected and prescribed intensity walking, with weekly frequency of three days on body mass in obese subjects. The session lasted thirty minutes and the speed observed for self-selected intensity was ~ 5.12 km / h, also presenting low RPE and pleasurable sensations. After intervention, they did not find significant alterations in the maximum oxygen uptake of individuals at self-selected intensity. In other words, exercise performed at 73.8 ± 9.2% of maximal heart rate produced pleasurable sensations; however, an improvement in maximal oxygen uptake was not established [26]. Accordingly, Elsangedy et al.[28] verified the self-selection method for different BMIs and observed that overweight, obese and normal weight individuals selected intensities that were below ventilatory threshold (<55% of $VO_2$max). For obese individuals, the average speed was 4.68 km / h in a twenty minute walk and the sensation was pleasurable. The authors suggest that the low self-selected speed would have the purpose of simply avoiding pain sensations from peripheral fatigue.

These evidences, together with our results, reinforce the contemporary idea about SPD modulation by RPE from exercise intensity. Studies have reported that the closer the intensity is to a threshold, the greater the unpleasant sensation[8]. This is because metabolic disturbances in this condition cause unpleasant interoceptive responses, such as pain. Thus, it is reasonable to suggest that obese individuals probably will not self-select intensities close to thresholds proposed by ACSM[9], which improve cardiorespiratory fitness and muscle strength. Conceptually, the dual model theory assumes that sensation is determined by cognitive factors (personality, self-efficacy, determination, etc.)[14]. This theory assumes that exercises performed at intensity below the anaerobic threshold, promote pleasure sensations, due to the reduced perturbation of the organic systems and the maintenance of cellular homeostasis. On the other hand, anaerobic thresholds (severe domain) increase the participation of cognitive processes, with high interindividual variation in the sensation responses. Some individuals interpret effort as pleasurable and others find it uncomfortable in

the moderate domain. At the anaerobic threshold or above (severe domain), whose interoceptive pathways act decisively, the sensation is unpleasant for most individuals[8,14]. Thus, subjects who do not practice physical exercises have low levels of pain tolerance and most of them do not perceive the discomfort generated by training as something pleasurable, which leads to the selection of low intensities. On the other hand, a recent study identified this condition in subjects with more than one year experience in the practice of resistance exercises. The research compared RPE and SPD in resistance exercise between self-selected and imposed intensity in trained women[29]. Supposedly, previously trained individuals would tend to self-select high intensities; however, the authors found insufficient loads (<57% 1RM) to promote strength and hypertrophy improvements. In addition, they demonstrated low RPE and higher pleasurable sensations for self-selected intensity compared to imposed intensities. Unlike expected, familiarized individuals do not produce perceptions of exertion and modulations of sensations so different from obese individuals when submitted to self-selected intensity. This condition leads us to believe that RPE and SPD responses are not directly related to BMI.

Thus, the homogeneous RPE and SPD trajectory evidenced throughout the training session (Figure 2) of the present study can be justified because intensity self-selection (<54% of $VO_2$max; <60% -70% of 1RM) was lower than percentages stipulated for significant physiological adjustments. That is, the search for pleasure advocated in the Hedonic theory seems to be a determining factor in the independent intensity self-selection of the population. The correlation results were consistent to studies of Buzzachera et al., And Chao et al.[15,30], who found a negative relation ($r = -0.649$; $p < 0.001$), showing that the low RPE level is inversely proportional to the displeasure sensation (less effort, greater pleasure).

Briefly, combined training has been shown to be effective in producing low RPE and pleasurable sensations. Thus, it was found that increasing volume can be a good strategy to preserve pleasurable sensations and generate low effort. Therefore, for future investigations, longitudinal studies should verify the possible physiological adjustments in obese individuals. Although the findings contribute to the knowledge of RPE and SPD responses in a combined training session, there are limitations in the present study that should be considered in the extrapolation of data. The menstrual cycle was not controlled, which may have partially influenced the SPD response. In addition, although the measurement of sensation was performed with the most adequate scale for this purpose, the circumplex model of activation recommends the use of the perceived activation scale, which was not incorporated in this study. Finally, the results are not applicable to other populations that do not correspond to the same characteristics as the sample of this study (subjects with higher age, male subjects, patients with special conditions and subjects with higher obesity levels).

## CONCLUSION

Self-selected intensity combined training was effective in maintaining low RPE levels and pleasurable sensations for sixty minutes. This result has an important practical application according to the hedonic theory that reports that individuals experiencing pleasant sensations regardless of what they are tend to reproduce this condition. In this way, self-selected intensity combined training becomes another prescription strategy when the main goal is to increase adherence. Thus, longitudinal studies should be conducted with the purpose of verifying the effect of self-selected intensity training on RPE, sensations of pleasure / displeasure and on body composition in obese individuals. This would confirm or not the effect of self-selected intensity combined training on reducing body weight, also showing whether the sensations of pleasure will actually remain in this condition throughout the training program. If the evidence indicates a reduction in body weight correlated with the pleasurable sensations of combined training, it would be possible to seek some relation with the levels of adherence to physical exercise, changes in lifestyle and consequent changes in body composition and health in obese individuals.

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