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Original Article

# Effect of a 12-week aerobic training program on perceptual and affective responses in obese women

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**Abstract.** [Purpose] The aim of this study was to observe the effect of self-selected intensity or imposed intensity during aerobic training on perceptual and affective responses in obese women. [Subjects] The study included 26 obese women aged 30–60 years. [Methods] The subjects were randomly divided into two groups, with 13 subjects in each group: self-selected intensity and imposed intensity (10% above ventilatory threshold) groups. All subjects completed an intervention program that lasted 12 weeks, with three exercise sessions a week. The rating of perceived exertion and affective responses (Feeling Scale and Felt Arousal Scale) were monitored in the first, sixth, and twelfth weeks. [Results] Significant differences were observed between groups in heart rate and rating of perceived exertion. The affective responses during exercise were more negative in the imposed intensity group. [Conclusion] Use of a self-selected exercise intensity can promote smaller negative affective responses during exercise and provide a sufficient stimulus for improvement in cardiorespiratory fitness.
**Key words:** Self-selected exercise, Rating of perceived exertion, Affective responses

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## INTRODUCTION

In recent decades, obesity has become a growing public health problem, and it is getting worse every year[1, 3)]. Excess body fat and lack of exercise can trigger the onset of cardiovascular disease, diabetes, and hypertension among other problems[2)]. However, regular physical activity can improve physical fitness and assist in the prevention and treatment of diseases related to a sedentary lifestyle and excess body fat[3–5)]. Although the benefits of a regular physical activity program are well-known and widespread, there are still many people who do not engage in physical activity regularly[6)].

Affective responses related to the activity performed are among the many factors related to nonparticipation of sedentary, obese subjects in physical conditioning programs[7)]. Affective responses are derived from the term affect, which is considered a valence, and measure contrasting feelings (positive/negative, comfort/discomfort)[8)]. Their purpose in exercise science is to measure the sensations of pleasure and displeasure related to physical activity[9)].

Studies have shown that affective responses tend to include feelings of pleasure during light- to moderate-intensity exercise and sensations of displeasure during severe- to vigorous-intensity exercise[10, 11)]. When a physical activity prescription provides an unpleasant feeling in the first weeks of exercise, there is a high probability of the subject abandoning the exercise in the following weeks[12)]. Therefore, research has found that subjects tend to deviate from previously prescribed intensities toward self-selected intensities in order to feel more pleasurable affective responses[6, 9)].

Use of a self-selected exercise intensity has been observed in several studies as an important strategy for the beginning of a regular physical activity program compared with an imposed intensity exercise[13, 14)]. A self-selected intensity can promote a sufficient incentive to provide physiological benefits and emotional sensations of pleasure in sedentary and obese individuals and increase the possibility of the subject continuing the activity[9, 15)]. However, most research has only observed acute conditions (a few sessions) and predicted possible chronic exposure (several weeks) situations. There is a lack of long-term studies investigating affective responses; therefore, the objective of the current study was to observe the effect of a self-selected aerobic training intensity and imposed aerobic training intensity on perceptual and affective responses in obese women.

## SUBJECTS AND METHODS

The subjects comprised a convenience sample of 26 obese women who met the inclusion criteria and gave written con-

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sent to participate in this study. All the subjects were sedentary (regular exercise <3 days a week). The inclusion criteria were as follows: (a) between the ages of 30 and 60 years, (b) ability to take part in regular physical exercise, (c) negative responses to all questions in the Physical Activity Readiness Questionnaire, (d) body mass index between ≥30 $kg.m^{-2}$ and ≤39.9 $kg.m^{-2}$, and (e) personal statement verifying that they have not smoked in the past 12 months. The exclusion criteria included the presence of cardiovascular, metabolic, or orthopedic disease or any other contraindications as determined by their medical history for the previous 12 months. The study was approved by the Research Ethics Committee of the Department of Health Sciences at the Philadelphia University Center in Londrina, Brazil.

The subjects were randomly divided into two groups, a self-selected intensity group and imposed intensity group (10% above the ventilatory threshold), with 13 subjects in each group. All subjects completed an intervention program that lasted 12 weeks, with three exercise sessions a week. Rating of perceived exertion (RPE), defined as the ability to detect and interpret organic sensations during the performance of physical exercise, was determined using the Borg Scale (6–20)[16]. This instrument comprises a 15-point Likert scale ranging from 6 ("minimal effort") to 20 ("maximum effort").

The affect was determined by the sense of scale using the Feeling Scale (FS) of Hardy and Rejeski[17]. This instrument comprises an 11-point scale ranging from +5 ("very good") to −5 ("very bad"), and zero on the scale is considered neutral. The Felt Arousal Scale (FAS) was used to measure the perception of activation[18]. This scale comprises six levels of activation ranging from 1 (low activation) to 6 (high activation). A high perception of activation can be characterized in the following ways: excitement, anxiety, or anger. Low activation appears as relaxation, boredom, or quiet.

The RPE and affective responses (FS and FAS) were monitored in the first, sixth, and twelfth weeks in accordance with the procedures proposed by Haile et al.[19] and Parfitt and Rose[11, 20]. The affective responses were assessed during and at the end of each session.

An incremental exercise treadmill test to exhaustion (model Super ATL, Inbramed™, Porto Alegre, Brazil) was performed using the standard protocol proposed by Bruce[21], which consisted of 3-min stages for the evaluation of $VO_2$ max. All subjects were verbally encouraged to continue the exercise to the point of exhaustion. The subjects had to meet at least two of the following three criteria in order to achieve $VO_2$ max: (a) a plateau of $O_2$ (changes <150 $mL \cdot min^{-1}$), (b) respiratory exchange ratio (RER) ≥1.10, and (c) heart rate (HR) of 10 $beats \cdot min^{-1}$ within the maximum level expected for their age[22]. HR ($beats \cdot min^{-1}$) was continuously measured using a Polar monitoring system (Polar Electro™, Oy, Finland). A K4 portable analyzer (Cosmed, Rome, Italy) was used to measure $O_2$, carbon dioxide production ($CO_2$), and pulmonary ventilation ($V_E$, STPD). The expired gases were collected and analyzed breath-by-breath. Before each test, the analyzer was calibrated. To determine $VO_2$ at the ventilatory threshold ($VO_{2VT}$), the standard procedure of visually identifying the point at which the ventilation plot ratio of oxygen consumption per minute ($V_E/VO_2$) versus the ventilation ratio of $CO_2$ production per minute ($V_E/VCO_2$) deviates from normal was used.

**Table 1.** Physiological and anthropometric characteristics

| | Self-selected intensity group | Imposed intensity group |
|---|---|---|
| Age (years) | 48.8 ± 7 | 42.9 ± 7 |
| Weight (kg) | 84 ± 8 | 89 ± 8 |
| Height (cm) | 1.58 ± 0.05 | 1.58 ± 0.05 |
| BMI ($kg/m^2$) | 33.4 ± 2.3 | 35.6 ± 4.2 |
| $VO_{2max}$ (ml/min/kg) | 19.5 ± 3.4* | 15 ± 4.3 |
| $HR_{máx}$ (bpm) | 171 ± 8 | 177 ± 7 |

*Significant difference between groups. BMI: body mass index

The walking sessions for both groups were performed on an official 400-meter tartan track (lane 1) that was demarcated meter by meter and supervised by an experienced fitness trainer. The exercise dose was closely monitored during each session. To monitor each bout of exercise, the distance traveled was recorded, and HR was observed during walking. All exercise sessions were conducted individually to avoid any possible effect on the responses to the exercise. Each session began with a 5-min warm-up and ended with a 5-min cooldown followed by a 5-min stretching period.

In the self-selected intensity group, the duration of each exercise session was 20 min on three nonconsecutive days. All subjects were given the following instructions: "You are supposed to choose a walking intensity of your preference. The session is supposed to last 20 minutes. The intensity must be high enough that you have a good workout but not so high that when exercising every day or every other day it stops you from continuing to exercise. The intensity must be appropriate for you"[23].

In the imposed intensity group, training (intensity 10% above the ventilatory threshold determined in the incremental test to exhaustion) was controlled by HR. Each exercise session lasted 20 min on three nonconsecutive days. Throughout the sessions, all subjects were verbally encouraged and given feedback to continue their efforts in maintaining the submaximal prescribed zone.

Data are presented as the mean ± standard deviation. The Student's t-test was used to compare the two groups' physiological responses, walking performance, and RPE. One-way ANOVA was used to compare weeks 1, 6, and 12 within the same group. Repeated measures ANOVA was used to compare the affective responses at different times of exercise. The level of significance was $p < 0.05$. Data were statistically analyzed using the SPSS computer program (version 17.0).

## RESULTS

The values of anthropometric characteristics and physiological responses of the maximum test are shown in Table 1. HR and RPE data for the first, sixth, and twelfth weeks are shown in Table 2.

Tables 3 and 4 show the affective response (FAS and

**Table 2.** Physiological, perceptual, and walking performance

| | Self-selected intensity group | | | Imposed intensity group | | |
|---|---|---|---|---|---|---|
| | HR (bpm) | RPE (0–10) | Km·h$^{-1}$ | HR (bpm) | RPE (0–10) | Km·h$^{-1}$ |
| Week 1 | 116 ± 11*$^{P}$ | 9.5 ± 1.8* | 4.9 ± 0.6$^{P}$ | 147 ± 11 | 12.9 ± 2 | 5.7 ± 1.2 |
| Week 6 | 117 ± 17* | 10.1 ± 1.7* | 5.3 ± 0.6 | 148 ± 8 | 12.6 ± 2.5 | 5.8 ± 1.0 |
| Week 12 | 129 ± 11* | 9.3 ± 1.3* | 5.6 ± 0.5 | 150 ± 8 | 14.5 ± 1.9 | 6.3 ± 1.1 |

*Significant difference between groups. $^{P}$ Significant difference between weeks 1 and 12 in the same group

**Table 3.** Affective responses of self-selected intensity group

| Self-selected intensity group | | | | | | |
|---|---|---|---|---|---|---|
| | Week 1 | | Week 6 | | Week 12 | |
| | Affective | Arousal | Affective | Arousal | Affective | Arousal |
| Pre | 4.6 ± 0.8$^{a, b}$ | 2.8 ± 1.3$^{a}$ | 4.2 ± 1.2$^{a, b}$ | 3.4 ± 1.5 | 4.2 ± 1.7 | 3.7 ± 1.4 |
| In-task | 2.8 ± 0.8 | 4.1 ± 0.9 | 1.9 ± 1.4$^{d, e}$ | 3.8 ± 0.9 | 2.3 ± 1.0$^{d}$ | 4.1 ± 0.9 |
| Post 0’ | 2.8 ± 1.3 | 3.8 ± 0.7 | 0.8 ± 2.2$^{f}$ | 4.2 ± 0.7 | 1.8 ± 1.7 | 4.6 ± 0.5 |
| Post 10’ | 4.1 ± 0.9 | 3.9 ± 1.0 | 3.8 ± 0.9 | 3.8 ± 1.2 | 4.2 ± 1.6 | 4.2 ± 0.9 |

Significant differences between $^{a}$ pre and in-task, $^{b}$ pre and post 0’, $^{c}$ pre and post 10’, $^{d}$ in-task and post 0’, $^{e}$ in-task and post 10’, $^{f}$ post 0’ and post 10’.

**Table 4.** Affective responses of imposed intensity group

| Imposed intensity group | | | | | | |
|---|---|---|---|---|---|---|
| | Week 1 | | Week 6 | | Week 12 | |
| | Affective | Arousal | Affective | Arousal | Affective | Arousal |
| Pre | 4.4 ± 1.4$^{a, b}$ | 3.1 ± 1.6 | 4.3 ± 1.3$^{a, b}$ | 3.7 ±0.9 | 4.2 ± 1.0$^{a, b}$ | 3.6 ± 1.1 |
| In-task | 0.6 ± 2.1$^{d, e}$ | 3.7 ± 0.8 | 0.0 ± 1.8$^{d, e}$ | 3.3 ± 0.8 | −0.3 ± 1.5$^{d, e}$ | 4.0 ± 0.7 |
| Post 0’ | −0.7 ± 3.0$^{f}$ | 4.2 ± 0.7 | −1.3 ± 2.4$^{f}$ | 3.6 ± 1.0 | −1.6 ± 2.1$^{f}$ | 4.5 ± 0.7 |
| Post 10’ | 3.6 ± 1.2 | 4.2 ± 1.2 | 3.2 ± 1.2 | 4.0 ± 0.8 | 3.6 ± 1.3 | 4.6 ± 0.5 |

Significant differences between $^{a}$ pre and in-task, $^{b}$ pre and post 0’, $^{c}$ pre and post 10’, $^{d}$ in-task and post 0’, $^{e}$ in-task and post 10’, and $^{f}$ post 0’ and post 10’.

FS) information for the imposed intensity group and self-selected intensity group in the first, sixth, and twelfth weeks, during four periods of training (pre, in-task, post 0’, and post 10’). Differences were observed in the self-selected intensity group between weeks and different times (pre, in-task, post 0’, and post 10’) of the exercise sessions for both groups.

## DISCUSSION

Physiological and perceptual responses, HR and RPE, were different between the two groups at weeks 1, 6, and 12. The observed values reflect higher intensity exercise in the imposed intensity group compared with the self-selected intensity group. The results are in agreement with previous investigations in which sedentary subjects also self-selected a lower exercise intensity, that the exercise prescribed on or above the ventilatory threshold, with HR and RPE higher than the imposed exercise[11, 20].

Additionally, regarding the physiological and performance responses observed during the training, differences were found in the self-selected intensity group between weeks 1 and 12 in walking speed and HR. These results are consistent with previous research, which showed that sedentary subjects are able to select an exercise intensity capable of promoting improvement in cardiorespiratory fitness[9, 24].

The affective responses to exercise in relation to intensity were observed in investigations by Parfitt[20], Sheppard[25], and Ekkekakis[26], revealing that intensities at or above the ventilatory threshold promote less pleasurable sensations. Therefore, when selecting an exercise intensity, sedentary subjects choose intensities below the lactate threshold, which promotes higher affective responses with lower perceptions of effort.

The results of the present study showed that in-task and post 0’ self-selected exercise intensity, the changes in affective responses (compared with pre-exercise) were lower than those in imposed exercise intensity. These results show that when subjects select the exercise intensity, they prefer something that does not promote very negative feelings in relation to prescribed exercise. Additionally, self-selected intensity was found to be sufficient to improve long-term physical fitness[13, 24].

With an imposed exercise intensity, the affective sensations obtained in the first week of training can predict the sensations of pleasure and displeasure over the next weeks. This fact indicates that changes in exercise prescription

can be made (decrease the intensity) to minimize negative emotional feelings and increase adherence to an exercise program[9, 27].

The current study demonstrated that self-selected exercise intensity can be an effective and important tool in exercise prescription for sedentary, obese women. This practice can promote smaller negative affective responses during exercise and provide sufficient stimulus for improvement of cardiorespiratory fitness.

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