



Original article

A hard/heavy intensity is too much: The physiological, affective, and motivational effects (immediately and 6 months post-training) of unsupervised perceptually regulated training

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Abstract

Background/Objective: There are several practical and theoretical advantages to perceptually regulated training, including its simplicity of use and potential to influence exercise motivation. The study objective was to examine if perceptually regulated training at ratings of perceived exertion (RPE) of 13 and 15 resulted in significant increases in aerobic fitness, reductions in metabolic risk factors, and changes in motivational constructs following an 8-week training program and at follow up 6 months after.

Methods: Following stratified randomization based on estimated aerobic capacity and sex, sedentary volunteers ($n = 63$; men = 21) were allocated to one of three groups: RPE 13, RPE 15, and control. The participants completed baseline, post-training, and 6-months post-training assessments for aerobic fitness, metabolic risk factors, and motivational constructs. The participants' acute exercise training responses (affect, competence, enjoyment, and work rate) were also recorded.

Results: The data support the fitness and motivational construct hypotheses but not the metabolic risk factor hypothesis. Aerobic fitness increased from the baseline to post-training in both RPE groups, with the increase maintained 6 months post-training only in the RPE 13 group. Exercise autonomy increased over the training program, with exercise competence and affect more positive in the RPE 13 group than in the RPE 15. However, the training programs did not reduce the metabolic risk factors, and attrition levels were high. Unsupervised training at RPE 13 and RPE 15 did improve fitness, but as hypothesized, this was not maintained in the RPE 15 group 6 months post-training.

Conclusion: The motivational processes associated with RPE 13 regulated exercise (greater competence and autonomy and more positive affect) potentially explain the maintained fitness in this group.

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Keywords: aerobic fitness; affect; competence; exercise intensity production; ratings of perceived exertion; self-determination

Introduction

Borg's ratings of perceived exertion (RPE) scale¹ can be used to regulate exercise intensity.^{2–4} This method of exercise intensity regulation may offer a number of practical and theoretical advantages for exercise training. Pragmatically, if

the RPE is used to regulate intensity in an exercise training context, then as the individual becomes fitter, he or she will automatically increase the work rate to achieve the RPE level.^{4,5} This mitigates the need to assess and reassess physiological variables, such as heart rate, lactate levels, or maximal oxygen uptake, to confirm if the RPE-regulated exercise intensity has produced a training effect. This makes the method user-friendly, inexpensive, and simple to administer and use. In programs where exercise intensity is prescribed based upon a heart rate bandwidth or a percentage

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of maximal oxygen uptake, these physiological variables need to be reassessed to ensure that the prescribed training intensity is modified to meet the physiological adaptation.

From a theoretical perspective, perceptually regulating exercise intensity can improve the motivation to exercise. According to the self-determination theory,⁶ autonomy (i.e., control) and competence are two of the three psychological needs required to support the development of intrinsic motivation. RPE-regulated exercise affords the individual control of the intensity for a specific RPE level. The individual chooses the intensity and is autonomous in changing it to meet his or her individual perception throughout the exercise session. When exercise intensity is prescribed, this autonomy is not present. Further, this control provides a sense of achievement and maintains competence throughout the session: the individual is actively involved and able to increase or decrease the intensity as necessary. When exercise intensity is prescribed, it may be perceived to be appropriate or otherwise too easy or too hard; neither of the latter perceptions would support the development of competence and motivation. In addition, affective responses (feelings of pleasure/displeasure) during exercise are intensity dependent and predict exercise behavior in the succeeding 6 months and 12 months.^{7,8} Williams' model,⁹ which integrates self-determination theory and hedonic theory (that behavioral decisions are made based upon the pleasure experienced),¹⁰ makes a case for self-paced exercise and explains the affective and motivational consequences of perceptually regulated exercise. When prescribed exercise rather than allowed to self-regulate, people have more variable and less positive affective responses,¹¹ even when the prescribed exercise intensity matches the self-regulated intensity.¹² Autonomy and affective response are positively associated,¹³ and achievement, ability to cope, and perceptions of control explain differences in affect in low-activity adults.¹⁴ Further, in a graded exercise test to volitional exhaustion, if the exerciser is in control of changes in exercise intensity, affect during the test is more positive than when he or she is not in control.¹⁵

Studies that have used RPE to perceptually regulate exercise intensity in a training program include a 4-week study¹⁶ with a 2-year follow up¹⁷ on residential cardiac patients; studies of breast cancer patients¹⁸ and survivors¹⁹; and an 8-week study of previously sedentary women.⁴ These studies have specified RPE levels of between 11 and 15 and reported improvements in physical performance, with some evidence to support the motivational influence of this method of training. In particular, Parfitt et al⁴ demonstrated that perceptually regulated exercise corresponding to RPE 13 is perceived to be “pleasant” during training. Over the 8-week training program in Parfitt et al's study, the affective responses recorded during training indicated that the participants felt “good” while exercising at a physiologically confirmed moderate to vigorous exercise intensity.

Although evidence and a theoretical explanation exist for why perceptually regulated exercise has beneficial affective

outcomes and is hence likely to improve adherence, there is very little research regarding the longer-term efficacy of a perceptually regulated training program to increase and maintain aerobic capacity and produce other health-related exercise benefits. There may be a delicate balancing act between exercise at an intensity which is pleasant (and hence encourages adherence) and exercise at an intensity which optimizes health-related benefits. Indeed, as exercise intensity increases above the ventilatory threshold, affective responses decline.¹¹

Parfitt et al⁴ support the effect of RPE-13 supervised training on fitness, health variables, and affect (fitness increased significantly, mean arterial pressure decreased, and affect remained positive) immediately following an 8-week training program. However, that study did not track outcomes beyond the 8-week program. We do not know if those effects were maintained at 6 months. The 8-week training program was also supervised on a one-to-one basis, and therefore, the translation and generalizability of RPE 13-regulated training to more natural gym environments (where one-to-one supervision is not available) is unknown. Furthermore, we do not know if perceptually regulated training at RPE 15 (hard/heavy) will improve health-related benefits. There is evidence that exercise at varying intensities have different effects on health-related outcomes. DiPietro et al²⁰ found that vigorous-intensity exercise is more beneficial in improving insulin sensitivity, and Moholdt et al²¹ observed that peak oxygen consumption [as measured by percentage heart rate maximum (%HRmax)] increased more markedly after higher-intensity training in patients with coronary artery disease. However, Midgley et al²² reported that long-interval training at 100% maximal capacity is extremely efficacious in improving fitness, albeit, barely sustainable by the participants.

Theoretically, perceptually regulated training clamped at either 13 or 15 on the RPE scale (the former indicating moderate exercise intensity²³ and the latter vigorous exercise intensity^{24,25}) should significantly increase aerobic fitness and reduce cardiac risk factors. Furthermore, as perceptually regulated training permits the participant to dictate the pace, intensity, and increments in intensity of the exercise and thereby achieve a sense of autonomy, motivation to exercise should become more intrinsic and influence long-term adherence to exercise behavior.⁹ Additionally, self-regulation should support the maintenance of positive affect, although affect should be lower at higher exercise intensities.¹¹ Consequently, affect should be lower during RPE 15 than RPE13 exercise.

This study therefore aimed to extend previous research and compare the effects of an 8-week unsupervised, perceptually regulated treadmill training program at RPE 13 and RPE 15 on fitness and other health measures immediately following and 6 months after completion of the program. A secondary purpose of this study was to assess the affective state (participants' pleasure/displeasure) during training and the motivational effect of training at RPE 13 and RPE 15. It was hypothesized

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