

EDITORIAL

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The importance of intensity in the prescription of health training [La importancia de la intensidad en la prescripción de entrenamiento para la salud]

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Introduction

Traditionally the prescription of physical activity for health has been focused on continuous low-intensity activities. These trainings were oriented to the development or maintenance of cardiorespiratory fitness, prescribing intensities close to 50% of maximal oxygen uptake (VO₂max) (ACSM, 1978). These intensity prescriptions have been criticized for their lack of specificity to obtain adaptations and for the often erroneous intensity prescribed, considering using the heart rate reserve (HRR) or reserve oxygen uptake (VO₂R) as parameters to prescribe exercise intensity (ACSM, 1998; Karvonen, Kentala and Mustala, 1957). In the same way, others authors proposed the necessity to overcome the mobilization threshold to obtain adaptations, then, the prescribed intensity should be higher, proposing intensities that can reach the 85% of VO₂R (ACSM, 2006; Asikainen, et al., 2002; Mors et al., 2004). Although these new intensity requirements, the exercises recommended still based on continuous methodologies, using aerobic exercises like walking, running... Currently, new training methodologies based on high intensity interval and strength exercises are showing major adaptations to different organic systems and greater efficiency than traditional training models based on continuous and low intensity training.

Benefits of intensity in aerobic exercise

New training models based on training intensity, that break with traditional approaches based on high volumes performed at low intensity, are showing greater improvements and higher training efficiency than this traditional training (Clemente-Suárez, Fernandes, Arroyo-Toledo, Figueredo, Gonzalez, Vilas-Boas, 2014; Arroyo-Toledo, Clemente-Suárez, Gonzalez, Ramos, Sortwell, 2013). Within these methodologies highlight the high intensity interval training (HIIT) that archived higher aerobic performance adaptations than traditional continuous methodologies (Gibala et al., 2006; 2012). This fact is due to the high stimulation of one of the major regulators of mitochondrial biogenesis in the muscle, the activated receptor gamma peroxisome proliferator (PGC-1 α) (Little & Cochran, 2011; Wu et al., 1999), being the essential factor to produce this stimulation of PGC-1 α the exercise intensity (Egan et al., 2010).

The main adaptations evaluated with this type of training compared to traditional training include increased activity of oxidative enzymes of fatty acids in muscle, increased buffering capacity, increased content of glucose transporter protein type 4 (GLUT4), increased glucose transport activity in skeletal muscle, increased citrate synthase, increased VO₂max and lactate threshold velocity (Gibala et al., 2006; Gibala et al., 2012; Terada, Tabata, & Higuchi, 2004; Terada et al., 2001; Tabata et al., 1997; Gharbie et al., 2008; Enoksen et al., 2010).

Effect of high intensity training in health

Several authors have shown that increases in PGC-1 α improve the oxidative capacity, antioxidant defence, glucose consumption, resistance to age-related sarcopenia and organic anti-inflammatory pathways (Sandri et al., 2006; Benton et al., 2010; Wenz et al., 2009). The HIIT induces great magnitude increases of cellular stress and peripheral vessels, effectively isolating the heart of this stress due to the short duration of the series (Little et al., 2011), which improves endothelial function (Wisloff et al., 2007; Tjonna et al., 2013; Moholdt et al., 2009), rest blood pressure (Rognmo et al 2004; Schjerve et al 2008, Whyte et al., 2010) and left ventricular morphology (Wisloff et al., 2007).

The HIIT have shown higher efficacy than continuous training, significantly increasing the cardiorespiratory fitness by almost double than moderate intensity continuous training, being a safety training in patients with lifestyle-induced chronic diseases (Weston, Wisloff & Coombes, 2014); archiving positively changes in blood lipids and improving insulin sensitivity compared to moderate-intensity exercise in obese adolescent females (Racil et al., 2013); inducing beneficial alterations in the resting inflammatory profile and adipose tissue proteome on overweight and obese males (Leggate et al., 1985); archiving greater and more lasting effects on reducing incremental postprandial glucose response in obese adults compared with continuous moderate-intensity training (Little, Jung, Wright, Manders, 2014);

increasing the capacity for fat oxidation during exercise in women (Talanian, Galloway, Heigenhauser, Bonen, Spriet, 1985); increasing the fat and carbohydrate metabolic capacities in skeletal muscle (Perry, Heigenhauser, Bonen, Spriet, 2008); and also was associated with increased patient compliance and improved cardiovascular and metabolic outcomes and weight loss (Shiraev & Barclay, 2012).

Specifically in diabetic patients, HIIT improved both the hepatic insulin sensitivity in sedentary overweight subjects (Whyte et al, 2010; Hood et al., 2011) and the insulin sensitivity due to the improvement in peripheral GLUT4, which was increased twice after a HIIT than a low intensity and high volume training (Hood, et al., 2011). Also, HIIT improve rapidly the GLUT4 content in skeletal muscle and reducing the blood glucose concentration (Little et al., 2011). In longer training interventions the implementation of HIIT improved the glycaemic control and aerobic capacity in glucose intolerant patients (Mancilla et al, 2014) and modified the post-exercise energy intake, decreasing the fact intake in comparison to moderate interval training (Alkahtani, Byrne, Hills, King, 2014). Another important aspect about HIIT, and the PGC-1 α increases that produce, is the decrease in the action of transcription factor family FoxO3, whose activation is related to muscle wasting (Sandri et al., 2006). This point would be important to include in training programs for older, as proposed recent research with this population (McKean, Stockwell & Burkett, 2012). Furthermore was found a greater negative energy balance after HIIT than after continuous exercise (Gerber et al., 2014) without an increased appetite (Deighton et al., 2013).

The future of high intensity training for health

The intensity is one of the most important key factors to increase athletes' performance, and gradually the current periodization training systems are adapting to the scientific evidences. Likewise in health area, the exercise recommendations and new training programs must be adapting the exercise prescription to models based on the intensity since they were more efficient and effective than traditional high volume low intensity training, but still needing more research to clarify a general recommendations for prescribing high intensity training in health training programs and in different populations either healthy or with some kind of pathology.

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