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Annals of Physical and Rehabilitation Medicine 55 (2012) 623–640

ANNALS OF PHYSICAL AND REHABILITATION MEDICINE

Literature review / Revue de la littérature

Relevance of the measure of perceived exertion for the rehabilitation of obese patients

Intérêts de la mesure de la perception de l'effort pour la réadaptation des patients obèses

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Received 14 October 2011; accepted 16 July 2012

Abstract

The most common tool used for measuring effort perception is the rating scale of perceived exertion (RPE) developed by Borg. This scale is also used for various outcomes in the general population. The validity and reliability of this scale have already been reported in obese patients. However, the relevance of measuring perceived exertion in obese patients is still poorly known. This review of the literature presents the Borg RPE scale (i.e., validity, reliability and recommendations) and its main advantages during graded exercise tests (e.g., comparison of physical capacity, predicting physiological variables, verifying exhaustion and exercise safety) and rehabilitation programs (e.g., individualized exercise intensity, evaluation of the impact of a rehabilitation program and even determining the perceptual preference) in obese patients. This review of the literature underlines the relevance and usefulness of the Borg RPE scale, which is still underused in obese patients. However, additional studies are still necessary before using this scale routinely in all obese patients (regardless of the severity of their obesity or associated complications).

Keywords: Ratings of perceived exertion (RPE); Obesity; Work capacity evaluation; Physical exercise; Exercise tolerance

Résumé

L'échelle de perception de l'effort (RPE) de Borg est actuellement l'outil le plus fréquemment utilisé pour mesurer la perception de l'effort. Cette échelle est utilisée à des fins variées dans la population générale. La validité et la reproductibilité de cette échelle ont déjà été étudiées chez le patient obèse. Cependant, les intérêts de la mesure de la perception de l'effort chez le patient obèse restent mal connus. Cette revue de littérature présente par conséquent l'échelle RPE de Borg (i.e., validité, reproductibilité et recommandations) et ses principaux intérêts lors d'épreuves d'effort maximal ou non (e.g., comparaison de la capacité physique, prédiction de variables physiologiques, vérification de l'exhaustivité d'un exercice, sécurisation des exercices) et de programmes de réadaptation à l'effort (e.g., prescription individualisée d'une intensité d'exercice, évaluation des effets d'un programme de réadaptation, ou encore détermination d'une préférence perceptive) chez le patient obèse. Cette revue de littérature démontre l'utilité encore mal connue de l'échelle RPE de Borg chez le patient obèse. Cependant, des études complémentaires restent encore à réaliser avant d'utiliser en routine cette échelle pour tous les patients obèses (quel que soit leur degré d'obésité et leurs comorbidités associées).

Mots clés : Perception de l'effort (RPE) ; Obésité ; Évaluation de la capacité de travail ; Exercice physique ; Tolérance à l'effort

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1877-0657/$ – see front matter
http://dx.doi.org/10.1016/j.rehab.2012.07.003

1. English version

1.1. Introduction

The concept of perceived exertion was introduced in the late 1950s with methods measuring local fatigue or breathlessness [5]. Perceived exertion is defined by sensations of effort, constraints, discomfort and fatigue felt by a person when exercising [41,51,55]. Perceived exertion is also used in various situations: ergonomics, education, sports or clinical application [55] to reach various objectives. Many authors [3,7,27,30,47,53] have developed and validated several scales to measure perceived exertion. However, the Borg rating of perceived exertion (RPE) scale remains the most commonly used one [32,38,48]. Thus, this review of the literature is only dedicated to the Borg RPE scale [3]. This scale is administered in training clubs, at home but also in many hospital and healthcare centers. It is also used in graded exercise tests (GXT) before and after a patient's training program, as well as all along these training programs in order to optimize patients' care management. In fact, the information delivered by the RPE scale can help design and manage each step of the patient's rehabilitation program.

Furthermore, for many decades, France has observed a constant increase in the prevalence of obesity, even though the latter has been leveling off [8]. In 2007, the total annual cost of obesity in France was estimated at oscillating between 2.1 and 6.2 billion Euros, i.e. corresponding to 1.5 to 4.6% of France's total healthcare costs (this number is probably quite underestimated today, since it was based on data from 2002) [19]. To decrease obesity prevalence and thus related healthcare costs, it has been proven that obese patients must exercise regularly. However, implementing a regular exercise activity (i.e., in a controlled setting with individualized exercise intensity) has been quite difficult with complicated technological apparatus used to set adapted exercise intensity (e.g., heart rate monitor, satellite tracking), sometimes quite costly (respiratory gas exchanges analysis to determine the patient's maximum exercise capacity), or not adapted to the patient's expectations (e.g., sometimes associations or healthcare centers propose walking exercises when the patient prefers cycling exercises).

As a result, the objective of this review of the literature was to present a simple and cost-effective tool, the RPE Borg scale [3], and to show its relevance when used with overweight or obese patients (most often without associated complications) in the framework of evaluating exercise capacity or prescribing the right rehabilitation program.

1.2. Presenting the Borg RPE scale

The first version of the RPE scale was designed in the 1960s by Gunnar Borg, PhD in Psychology. Since then, this tool has been updated to become the most commonly used scale to assess effort exertion [32,38,48]. This scale is made up of 15 different levels, comprised between 6 and 20, associated to verbal feedback (going from ''extremely light'' for level 7 to ''extremely hard'' for level 19), in order to obtain a subjective description of exercise strenuousness (Table 1). The numeric values of the various levels were chosen in order to determine the heart rates (HR) of a medium-aged, sedentary and healthy man during GXT on an cycle ergometer or treadmill (RPE $\times$ 10 = HR) [4]. Thus the numbers 6 and 20 were chosen as minimum and maximum values, since these numbers multiplied by ten are meant to represent respectively the resting heart rate (HRrest = 60 bpm) and the maximum heart rate (HRmax = 200 bpm) of a young healthy and sedentary adult male [4]. The RPE scale has been designed to correlate various physiological and perceived responses to different exercise constraints [31]. As reminded by Garcin [26], perceived exertion is a quantitative translation of a complex psychological and physiological process based on the individual assimilation of varied sensations and perceptions of effort and stress caused by physical workout, with each sensation bearing a subjective value. From its beginnings, the RPE scale has been widely promoted and used in various applications such as sports training, ergonomics or rehabilitation programs [5]. This scale has been translated and validated in several languages [36,62] including French (Table 1) [56]. Thus, in French-speaking countries to assess perceived exertion, one just needs to ask the

Table 1
Ratings perceived exertion scale of Borg (1970) and these instructions.

How hard do you feel this exercise?	While exercising we want you to rate your perception of exertion, i.e., how heavy and strenous the exercise feels to you.
6	The perception of exertion depends mainly on the strain and fatigue in your muscles and on your feeling of breathlessness
7 Very very light	or aches in the chest
8	Look at this ratin scale; we want you to use this scale from 6 to 20, where 6 below while means ''no exertion at all'' and
9 Very light	20 means ''maximal exertion''
10	9 corresponds to ''very light'' exercise. For a normal, healthy person it is like walking slowly at his or her own pace for
11 Light	some minutes
12	13 on the scale is ''somewhat hard'' exercise, but it still feels OK to continue
13 Somewhat hard	17 ''very hard'' is very strenous. A healthy person can still go on, but he or she really has to push him- or herself. It feels
14	very heavy, and the person is very tired
15 Hard	19 on the scale is an extremely sternous exercise level. For most people this is the most strenous exercise they have ever
16	experienced
17 Very hard	Try to appraise your feeling of exertion as honestly as possible, without thinking about what the actual physical load is.
18	Do not underestimate it, but do not overestimate it neither. It is your own feeling of effort and exertion that is important,
19 Very very hard	not how it compares to other people's. What other people think is not important neither. Look at the scales and the
20	expressions and then give a number. Any question?