



APPLYING THE BORG'S RATINGS OF PERCEIVED EXERTION SCALE TO ASSESS MOTOR DEVELOPMENT IN ONLINE UNIVERSITY LEARNING

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ABSTRACT

Physical education and sports lecturers should evaluate the impact of physical exercises proposed for implementation in the home environment. The use of self-report scales for the degree of physical exertion is a valuable tool for objectivity and tracking the physical effort exerted by students. The Borg Scale of Perceived Exertion (RPE) that subjects self-report exercise intensity during exercise. This paper aims to analyze the available literature regarding the application and validity of the scale and to determine whether the Borg of Perceived Exertion Scale can be applied during distance education in physical education and sports at the university. This narrative review combines theoretical analysis and reflective insights to gather information about the suitability of the Borg scale for use in distance learning students in physical education and sports. Results and discussion: During the search for innovative methods of work in the discipline of Physical Education and Sport, no data on the use of the Borg Scale in students were found. According to the available scientific studies, the Borg Scale is a good tool that can be used to plan the intensity of training programs, assess physical exertion, and as a means of controlling recovery from physical fatigue. Conclusion: The use of the scale as a tool for self-assessment by students of the degree of physical exertion will facilitate the optimization of academic and sports programs at the university. In this way, the physical load would correspond more precisely to the individual motor qualities and physical capabilities of the students.

Key words: overload, training loads, Borg Scale of Perceived Exertion, self-report questionnaire

INTRODUCTION

Over the past few years, many universities have also included an online learning mode. As a consequence of immobilization due to distance learning, negative changes in the health status of students are also noticeable (Slavcheva-Hinkova & Bozhkova, 2020; Ignatova & Iliev, 2022; Ignatova, 2021; Petkov, 2023). It is important to monitor how hard physical exertion is practiced and whether recovery after that is enough (Dyakova et al. 2017; Ivanova & Petkov 2019). The collection of data on the degree of physical exertion in independent training is of great importance for sports science. Determining the current individual condition through an appropriate assessment tool would serve to control and properly dose

the physical load. Many sports professionals are looking for the most appropriate tools or techniques to monitor and measure the degree of physical exertion (Belomazheva-Dimitrova, 2020; Ignatova, 2023; 2020). With the help of these tools it will be possible:

- To gather reliable, accurate and easy-to-interpret information about physical exertion
- To make an informed choice of specific sports activity combinations of measurements of internal and external variables indicating the degree of load and exertion
- To individualize physical loading
- To optimize workout and recovery programs
- To expand the knowledge of students, instructors, lecturers and coaches

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The Borg Scale of perceived exertion (RPE) is a relatively new metric in weight training, resistance training, aerobic load, and other types

of exercise programs. There are no available publications and data on the use of the Borg scale for assessing physical exertion in the training of students in Bulgaria. The relationship between perceptions of effort and physical work has been investigated by G. Borg and H. Dahlström (Borg & Dahlström, 1960). The concept of perceived load rating was introduced by Gunnar Borg in 1970 in his scientific publication "Perceived Exertion as an Indicator of Somatic Stress" (Borg, 1970) since then, the concept has been the subject of interest in various sports and health specialists. During the search and application of innovative working methods in the discipline of Physical Education and Sport at Trakia University, an opportunity to evaluate the work through the Borg 15-point (RPE) scale was opened. This scale could be used more often in training programming and planning, as well as for students who participate in university competitions and tournaments. The conducted study may be useful for coaches and teachers of physical education and sports when choosing different tools to perform proper quantification and interpretation of training load. The variant of the Borg scale we are considering represents a 15-point scale from 6 to 20 (Category Scale-15). The different steps of the scale correspond to a certain degree of load. A conscious sense of how hard and burdensome physical work is established. The biggest advantage of the Borg scale (RPE) is that it allows the athlete (or coach) to dose the training load according to the current individual condition. The Borg CR-15 (RPE) is a subjective, self-performed exercise intensity assessment based on an individual's personal perception of physical exertion. This scale is most often used to monitor the intensity of various aerobic workouts. The results obtained after its application can be used to measure the degree of intensity during exercise, and this would ensure safe physical exertion based on the perception of the individual. The perceived effort depends, in addition to heart rate, on breathing, which is related to the intensity of the workout. There are reasons why the Borg 15-point scale (RPE) should be used often, as it is a simple method, but gives an idea of the level of physical exertion (Borg, 1970; Borg, 1982; Borg, 1990; Morishita et al., 2018). To determine the effectiveness of the workout, careful monitoring of the duration and intensity

of the exercises that are performed is required. Follow-up of evoked specific physiological responses at a given duration and intensity would enable the improvement of training programs. The duration of physical exertion is an easy-to-monitor component, and by controlling the intensity of the exercises, higher efficiency can be achieved and the selection of appropriate exercises can be improved (Bosquet, 2012). The most common, affordable, and reliable method of monitoring intensity is heart rate (pulse) and this is grounds for it to serve as a component and framework of the Borg scale (Achten & Jeukendrup 2003). Through proper load monitoring, it can be tracked whether the athlete adapts to the training program. In addition, to reduce the possibility of developing dysfunctional overload and/or trauma – Halson, (2014); Haddad et al. (2017); Jatene et al. (2019).

METHODOLOGY

Using expert literature, the authors suggest that the application of the Borg scale (RPE) be used as a tool for self-assessment of post-workout physical exertion rates in university students. Each participant gets acquainted with the description in advance of the activities and their corresponding rating on the Borg 15-point scale (**Table 1**). To make it clearer to determine the degree of effort, there are examples of activities that are described in **Table 2**. After the completion of the sports activity or the specified physical work through this scale, a self-assessment is given by the athlete. Each individual should answer a simple question: "How was your workout?". The student indicates a single number retrospectively assessing the average intensity of the entire workout. Whatever number is indicated by the performer on a scale of 6 to 20, a zero must be added to it and so equals the current working heart rate. By tracking pulse values during exercise, it is easy to determine whether the load is below or above individual capabilities and based on this to make appropriate adjustments. The dependence is directly proportional: with an increase in heart rate, the intensity of training increases, and vice versa. The optimal level of intensity for exercise depends on the individual. The most commonly recommended exercise guidelines are 30 to 45 minutes at a moderate-intensity rate, five days a week, and this correlates with grades 12 to 14 on the Borg scale (RPE).

Table. 1 Borg scale

Rating	How Hard you are Exercising - description
6	No, exertion at all
7	Very, very light
8	
9	Very light
10	
11	Light
12	
13	Somewhat hard
14	
15	Hard
16	
17	Very hard
18	
19	Extremely hard
20	Maximal Exertion

Table 2. Examples of activities on the Borg Scale

Examples of activities on the Borg Scale	Rating
Lying on the couch	6
Bending over to put on your shoes	7 to 8
Easy household chores, such as laundry	9 to 10
Calm walking, which does not increase the heart rate	11 to 12
Brisk walking or moderate activity that speeds up your heart rate without causing you to gasp	13 to 14
Vigorous activity, such as jogging, cycling, or swimming (increases your heart rate and makes you breathe harder and faster)	15 to 16
The highest level of activity you can continue to do without stopping, such as running	17 to 18
A short rush of activity, like a sprint you can't do for a long	19 to 20

RESULTS AND DISCUSSION

Practicality of the Borg Scale

The principles, methods, and practices for measuring external and internal load are relatively well-defined. Within different sport-specific contexts, each of the measurement methods used has strengths but also limitations (Halson, 2014; Mujika, 2017; Borresen & Lambert, 2009).

The quantification of training loads provides valuable information to reduce overtraining and detect the risk of injury. It is necessary to manage the physical load to determine the ideal stimulus, minimize the risk of injury, and at the same time refine sports performance. In the study by Garcia et al. (2022) training load is assessed using the Borg Scale (RPE) and observed injuries are described. The highest injury rates were recorded during the last part of training and matches. That's when physical and psychological fatigue peaks. This low-cost and

easy-to-use method (RPE) provides valuable data for determining the degree of physical exertion and planning. Appropriate load correction would prevent injuries and overtraining. The scale could be used to plan the intensity of training programs, assess physical exertion, and a means of control in recovery from physical fatigue according to Mathiassen et al. (2014) and Williams, (2017). The analysis of López et al. (2021) includes the objective and subjective workload through daily monitoring via the Borg Scale (RPE) and control of total minutes of training and competition. These authors accept that the Borg Scale (RPE) may be an adequate method for quantifying training load.

Borg scale (RPE) validity

Some authors investigated whether a Borg scale (RPE) could be manipulated. According to the psychobiological model of endurance, RPE is a central limiting factor in performance. Bieleke

& Wolff, (2017) investigate whether RPE can self-regulate during static muscle endurance exercises, to improve performance. Published results suggest that RPE during an endurance task can self-regulate by consciously ignoring the sensation of physical effort. It would be good to keep these data in mind when studying correlations between physiological processes and level of performance. The meta-analysis done by Chen et al. (2002) studied correlations between the scale and some physiological processes - heart rate, blood lactate concentration, percentage maximum oxygen uptake, oxygen uptake, ventilation, and respiratory rate and summarized that although the Borg scale (RPE) was shown to be a valid measure of exercise intensity, its validity is high only under certain conditions. Luana et al., (2020) present data on a high positive correlation of the scale with heart rate and oxygen consumption. The conclusion that is given is that the scale is reliable for young and adult women. In the study of Chen et al. (2013), correlations of heart rate with RPE scale values were also observed when performing dynamic and static exercises.

Accessibility of the Borg scale (RPE)

The rapid development of high technology has recently created many surveillance devices that could be widely used in the sports industry. Heart rate monitors (HR), global positioning systems (GPS), and body-carrying devices are all part of these micro-technologies. These gauges can provide coaches with very detailed information on external (distance, speed) and internal variable factors (HR, HR variability). These devices track and record accurate information, but their high cost is a disadvantage. Expensive equipment is usually not found in gyms. McCulloch et al. (2018); and Bosquet, (2012) also emphasize that specialists with high technical and medical expertise are needed, moreover, a lot of time is required for servicing and interpreting the collected data. GPS time and motion analysis is only possible in outdoor environments, requires hardware and software, and is limited to locomotor movements and position tracking Bourdon et al., (2017). In contrast to the listed technological measuring tools, RPE is an inexpensive method that has the advantage of quantifying the load, regardless of mode or location.

The aim of another study conducted on female football players from the First National

Division was to determine whether the assessment of perceived training load using a Borg Scale (RPE) correlates with the GPS-derived measures of training load. Askow et al., (2021) report that the results of the RPE-scale of Borg are strongly related to external measurements of physical exertion.

From 2001 to December 17, 2016, this method was used in 950 studies (PubMed, SPORT Discus, and Google Scholar Search) according to scientific analyses by Haddad et al. (2017). Their study covers numerous publications on the application of an RPE test to athletes of any gender, age, or competition level. The Borg scale (RPE) appears to be an accessible, practical, and valid tool for monitoring and changing exercise intensity, regardless of gender, age, exercise modality, or physical activity level according to publications by Scherr et al., (2012). Their cohort study involved 2,560 men and women (mean age 28 (IQR 17-44) years). They concluded that exercising at RPEs of 11-13 ("low") was recommended for less trained people, and an RPE of 13-15 could be recommended when more intense exercise was desired.

CONCLUSION

The collection of data on the level of physical exertion in training and competitions is important for the sport. The Borg scale (RPE) is taken as an affordable solution and defined as a simple, non-invasive, and inexpensive method of monitoring physical exertion. The Borg scale is imposed as a practical tool also because of its strong correlations with other objective methods for determining maximum effort, despite some weak points. The Borg scale could also be applied during physical education and sports training at the university. The use of the scale as a self-assessment tool by students of the degree of physical exertion will facilitate the optimization of academic and sports programs at the university. In this way, the physical load would correspond more precisely to the individual motor qualities and physical capabilities of the students.

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