



SUBJECTIVE ASSESSMENT OF FATIGUE IN 12 YEARS OLD CHILDREN

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Abstract

Purpose. The aim of this study was to test the ability of self-estimation subjective degree of fatigue in 12 years old children.

Methods. Therefore, the heart rate (HR) of our children was recorded after different times within physical education lesson (immediately after 10, 20, 30, 40 and 50 minutes). At the same time with HR evaluation, pupils were asked to indicate a specific figure on the Borg Scale.

Results. The results showed that pupils at this age have the tendency to underestimate the intensity of effort.

Key words: subjective assessment of fatigue, Borg Scale, pupils 12 years old.

Introduction

The Borg Scale (G. Borg, 1982) is a simple method of rating perceived exertion (RPE) and can be used by coaches to measure athlete's level of exercise intensity in training and competition. Also, the RPE Scale is used worldwide by professionals in exercise physiology, sports medicine and psychology, wellness and ergonomics (Borg, G., 1998)

Subjective fatigue level perception recorded during the course of exercise is a trained capacity. In 1973, psychologist Gunnar Borg proposed a scale to estimate subjective perception of physical fatigue (appendix 1). Borg scale (Borg scale or RPE = Rate of Perceived or Exertion) is a valid reliable instrument with which could be performed a subjective assessment of exercise intensity (G. Dumitru, 2006).

The RPE Scale is used in some research studies for the respective purpose, but may also be used in training programs to describe the intensity of training sessions. Also RPE may be used to predict relative metabolic demand, especially at higher workloads and could be a useful tool for supervising intensity of solicitation during vigorous exercise.

Perceived exertion is how hard you feel your body is working. It is based on the physical sensations that a person experiences during physical activity, including increased heart rate, increased respiration or breathing rate, sweating, and muscle fatigue. Perceived exertion is the best subjective indicator of the degree of physical intensity.

Although the RPE is a subjective measure, it is proved that a person can realize a fairly good estimate of the actual heart rate during physical activity (G. Borg, 1998). The Borg RPE Scale is a tool for estimating effort and exertion, breathlessness and fatigue during physical work

A large number of papers (G. Dumitru, 1993; M.J. Chen, X. Fan, S.T. Moe, 2002; <http://www.cdc.gov/physicalactivity/everyone/measuring/exertion.html>, <http://www.brianmac.co.uk/borgscale.htm>) have showed that subjective estimating of the effort is strongly correlated with exercise loads, heart rate (HR), oxygen uptake (VO₂) and pulmonary

ventilation.

There are three versions of this scale:

1. Borg 6-20 - the original scale as developed by Borg, with the ratings between 6-20 which can correspond to 1/10 of the exercise heart rate.
2. Borg CR10 - an updated combined category and rating scale by Borg with the ratings between 0 (nothing at all) and 10 (very very hard).
3. Rob's RPE-5 Hand Scale - a new scale with some advantages over the other scales. For this RPE Scale, the subject just holds up the fingers of their hand to indicate the intensity level - from 1 to 5 (<http://www.topendsports.com/testing/rpe.htm>).

Some investigations recognize the potential methodological and semantic limitations of existing category perceived exertion scales when used in children.

The results of the review (A. Gros Lambert, A.D. Mahon, 2006) show that the cognitive developmental level of children aged 0-3 years does not allow them to rate their perceived exertion during a handgrip task. From 4 to 7 years of age, there is a critical period where children are able to progressively rate at first their peripheral sensory cues during handgrip tests, and then their cardiorespiratory cues during outdoor running in an accurate manner. Between 8 and 12 years of age, children are able to estimate and produce 2-4 cycling intensities guided by their effort sense and distinguish sensory cues from different parts of their body. However, most of the studies report that the exercise mode and the rating scale used could influence their perceptual responsiveness.

However, for a long time, the fact that children can achieve more or less correct self-estimation degree of fatigue that come from performing a particular exercise was ignored.

The ratings of perceived exertion are commonly employed within both a clinical and exercise setting to quantify, monitor and evaluate an individual's exercise tolerance and level of exertion. Recent advances in the area of perceived exertion have led to novel applications in the use of the ratings of

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perceived exertion scale as a means of predicting an individual's maximal functional capacity (VO₂max) for exercise (D.M. Lambrick, 2010). Yet the utility of such procedures with children has received little or no research attention. It is often presumed that like adults, a child's perception of exertion rises linearly with increases in exercise intensity, despite a limited amount research suggesting otherwise (D.M. Lambrick, 2010).

Hypothesis

It was assumed that middle school children are able to correctly assess the degree of fatigue generated by the exercise performed during school physical education lessons.

Material and methods

The purpose of this study was to determine the degree of fatigue self-esteem capacity during physical education lessons for 12 years old children.

In the first phase, the experiment consisted in an application of an opinion questionnaire that contained questions about how children perceived physical exertion during the physical education lesson. The second phase of the experiment was conducted one week after the application of questionnaires, and consisted in the assessment of heart rate (HR) of the pupils, at different moments of the lesson (immediately, after 10, 20, 30, 40 and 50 minutes).

In the moment of HR evaluation, the Borg Scale was presented to children. According to preliminary instructions, the children indicated a certain number on the scale that best described the perceived fatigue after effort performed, until that moment.

The study was conducted on 24 children (12 girls, with a mean age of 12.41 ± 0.29 years and 12 boys with a mean age of 12.55 ± 0.30 years), from Nicolae Tonitza School in Constanta.

For the statistical treatment of data we used the following parameters: average, standard deviation, the difference meaning between average and Bravais-Pearson correlation coefficient. The threshold for significance was set at p<0.05.

Results and discussions

Analysis of questionnaire responses revealed the following: in item 2, "How do you think are physical education classes? a) very difficult b) difficult c) moderate d) mild e) very light ", 35% of the girls considered that physical education lessons were mild, while 20% of them said difficult; the remaining 45% were undecided. 70% of the boys indicated that physical education lessons were light, and only 15% of the boys considered that physical education lessons were heavy; the remaining 15% of the boys were undecided. So, for 53% of the sixth grade children, physical education lessons were not considered exhausting, while for 18% of them, this was not true (fig. 1).

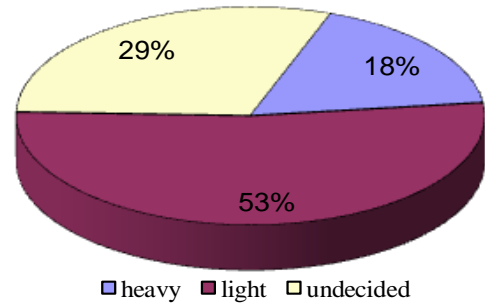


Fig. 1. Responses of the sixth grade children to item no. 2.

In question no. 9. "During physical education lessons I feel tired: a) very soon b) soon c) moderate d) later e) very late", 30% of the sixth grade girls said that the effort in physical education lessons induced a soon fatigue, while 25% of them said the opposite. In boys, only 15% of them believed that the effort in physical education lessons induced a soon fatigue and 65% of them were not supportive for this.

Overall, in the sixth grade, 45% of pupils surveyed said that physical education lessons were not so demanding as to lead to rapid fatigue, and only 23% of them, said that the opposite was valid (fig. 2).

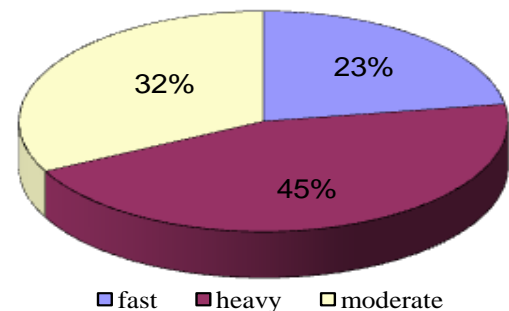


Fig. 2. Responses of the sixth grade children to item no. 9.

For both sixth grade girls and boys, the tendency was to under-estimate the level of exercise performed, regarding the subjective perception of exercise intensity on Borg scale. The real HR values evaluated by the experimenter was significantly higher (p<0.001) than the subjective HR estimated by the children, at various moments of the lesson (fig. 3).

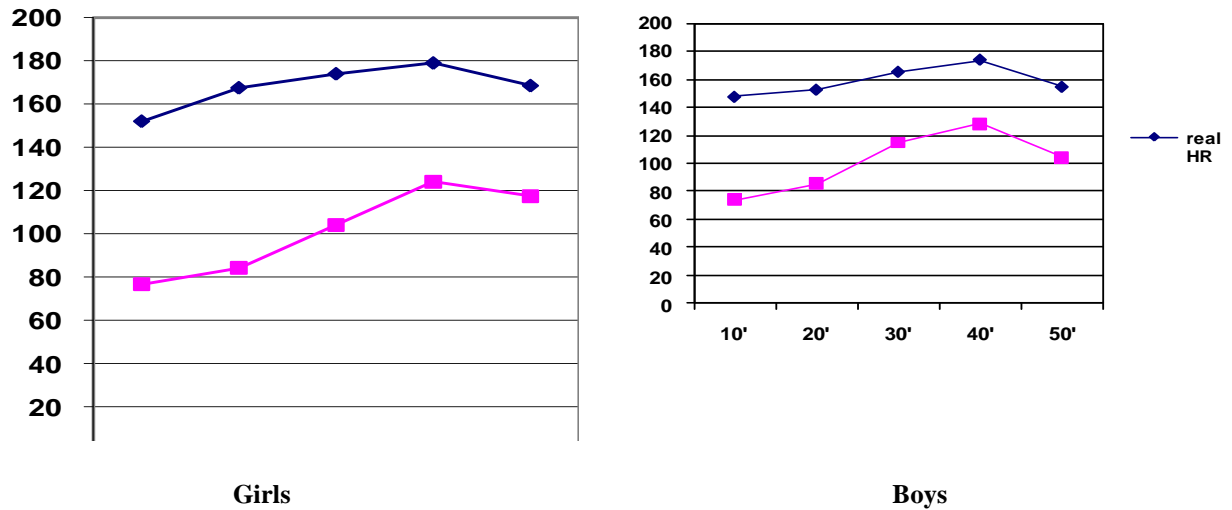


Fig. 3. Real and subjective HR (beats/min) of six grade children recorded during various moments of physical education lesson.

Correlations made between children responses to the questionnaire and the actual intensity of exercise in physical education lesson (based on the real HR) were not significant ($r_{\text{girls}} = 0.434$, $r_{\text{boys}} = 0.058$). Also, between the questionnaire responses and exercise intensity perceived by subjects based on subjective HR values, correlations were not significant ($r_{\text{girls}} = -0.021$, $r_{\text{boys}} = -0.036$), although both types of data were subjective estimates. Results confirm that at this age (12 years old), children does not have a good self-estimation capacity of the performed exercise intensity.

Studies of D.M. Lambrick, (2010) provide evidence to suggest that a child's perception of exertion may rise linearly or curvilinearly in relation to increasing work, during either cycle ergometry or treadmill exercise. These studies support the utility of a unique, curvilinear, paediatric ratings of perceived exertion scale in obtaining accurate exertional responses from young children, across differing modes of exercise.

In according with A. Gros Lambert, A.D. Mahon, 2006, RPE appears to be a cognitive function that involves a long and progressive developmental process from 4 years of age to adulthood. While much is known about RPE responses in 8- to 12-year-old children, more research is needed to fully understand the influence of cognitive development on perceived exertion in children, adolescents and elderly individuals.

Conclusions

The hypothesis is not confirmed, because 12 years old pupils, regardless of gender, are tempted to underestimate the intensity of effort realized in physical education lessons.

Therefore, physical education teachers must educate the ability, in children, of exercise intensity

correct self-estimation, in other words to appreciate how their body responds to exercise.

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