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Rating perceived exertion using facial expressions for children

Workload or exercise level can be subjectively or objectively assessed. Heart rate (HR), oxygen uptake, and blood lactate level are often used to objectively assess workload or exercise level. These physiological responses can be measured using instruments. Subjective assessment of workload or exercise level mainly relies on people's perception of their limb muscles or respiratory system (e.g., fatigue, difficulty breathing, and pain) during working and exercise. The rating of perceived exertion (RPE) scale was developed to help athletes and workers determine and monitor their exercise and workload intensities, respectively. In general, the RPE scale uses numbers and simple words to express physical perception. Compared with other methods for objective assessment of working and exercise intensities, the RPE scale can be used to more rapidly and cost-effectively measure physical perception. The Borg RPE scale has been developed for over a half century and has been widely applied to assess overall physical load of the body. However, whether people of various age groups understand the written words used in the Borg RPE scale without difficulty should be investigated.

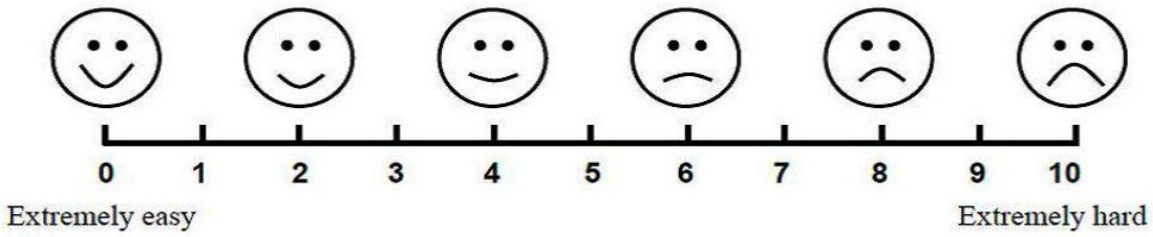

Fig. 1. Facial RPE scale proposed in this study.

Fifteen children and 15 young adults participated in the study. Each participant randomly performed 5 pedaling tests with one repetition based on their submaximal acceptable workloads. Under each load condition, participants pedaled on a cycle ergometer for 10 min; subsequently, participants completed Borg category ratio (CR10) or facial RPE scale assessments. Participants' HR were used to compare their scores on the Borg CR10 and Facial RPE scales.

The results show that that both Borg CR10 and Facial RPE scales reflected different pedaling workload levels ($p < .005$). For young adults, HR and RPE were positively correlated under the various workload levels (r = .989 for Borg CR10 and .977 for Facial RPE, all $p < .005$); for children, only Facial RPE scores were positively correlated with HR (r = .908, $p < .05$). In other words, Facial RPE scores effectively reflected the HR of children, whereas Borg CR10 scores did not (r = .498, $p = .392$). Therefore, the Borg CR10 scale, which uses written words to describe physical workload, did not reflect the HR of children recruited in the study.

This result may relate to the fact that the children may not understand words as effectively as young adults did, however, they understand facial expressions. The Facial RPE scale proposed in this study is superior to

the Borg CR10 scale because it can be used to assess those who cannot comprehend the written words used for the scale. In addition, regarding assessment of the physiological workload index of children (e.g., HR), the validity of the Facial RPE scale is superior to that of the Borg CR10 scale.

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Publication

A rating of perceived exertion scale using facial expressions for conveying exercise intensity for children and young adults.
Chen YL, Chiou WK, Tzeng YT, Lu CY, Chen SC
J Sci Med Sport. 2017 Jan