

BORG SCALE

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Borg Scale

Primary Disciplinary Field(s): Exercise Physiology, Clinical Rehabilitation, Psychology

1. Core Definition

The **Borg Scale** is a widely recognized and frequently utilized psychophysical tool designed to quantify an individual's subjective perception of exertion or discomfort during physical activity. Developed by Swedish psychologist Gunnar Borg, the scale provides a reliable, non-invasive method for subjects to rate their physical strain, effort, and fatigue. Unlike objective physiological markers such as heart rate, oxygen consumption (VO₂), or blood lactate levels, the Borg Scale captures the holistic, integrated sensation experienced by the exerciser, reflecting the complex interplay between central nervous system output and peripheral feedback mechanisms.

The fundamental principle underpinning the Borg Scale is the relationship between the intensity of external physical work and the internal sensory feedback generated by the body. This feedback encompasses both central (e.g., breathing effort, overall feeling of tiredness) and peripheral (e.g., muscle pain, localized fatigue) signals. By converting these subjective feelings into a quantifiable number, the scale allows clinicians, researchers, and trainers to monitor, prescribe, and adjust exercise intensity effectively, making it an indispensable instrument in settings ranging from athletic performance optimization to medical rehabilitation protocols.

The term **Borg Scale** typically refers to a system composed of two distinct, yet related, scales: the original 6-20 Rating of Perceived Exertion (RPE) scale and the later, more specific Category-Ratio (CR10) scale. While both scales measure perceived intensity, they differ in their numerical structure and primary application focus. The RPE scale is often used for global assessment of cardiovascular effort, while the CR10 scale is frequently employed to isolate and monitor specific symptoms like dyspnea or localized muscular pain, offering a nuanced view of the exercise experience.

2. Etymology and Historical Development

The development of the Borg Scale is rooted in the pioneering work of Dr. Gunnar Borg (1927-2020), a prominent figure in the field of psychophysics and experimental psychology. Dr. Borg dedicated his career to developing reliable methods for scaling sensations, demonstrating that the intensity of a subjective experience could be accurately correlated with the intensity of an external stimulus. Recognizing the need for a practical method to assess exercise intensity that went beyond simple physiological monitoring, especially in situations where heart rate monitoring was impractical or unreliable (such as in patients on rate-altering medications), he formalized the first version of the scale in the late 1960s and early 1970s.

The initial scale, the **Rating of Perceived Exertion (RPE)**, utilized a numerical range from 6 to 20. This seemingly unusual range was deliberately chosen to approximate the actual heart rate (HR) of the individual during exercise when multiplied by ten. For instance, a perceived exertion rating of 12 was intended to correspond approximately to a heart rate of 120 beats per minute (bpm). This direct proportionality provided a simple, powerful bridge between subjective perception and objective physiological measure, significantly contributing to the scale's rapid adoption in exercise physiology research and clinical practice worldwide.

Following the success of the RPE 6-20 scale, Borg later introduced the **Category-Ratio (CR10)** scale. This adaptation addressed situations requiring a finer, ratio-based measure for symptoms that might exceed typical exertion levels or required assessment using a more standard 0-10 pain or intensity format. The CR10 scale is a true ratio scale, meaning that a rating of 8 is intended to represent twice the intensity of a rating of 4. This methodological advancement allowed the scale to be applied effectively across various domains, including pain management, clinical symptoms monitoring (like shortness of breath), and assessment of maximal effort beyond the typical physiological limits captured by the RPE 6-20 scale.

3. Key Characteristics: The Dual Scales

The Borg system is characterized by its dual nature, encompassing two distinct scales, each optimized for different clinical and research objectives. The original RPE scale remains highly popular in general fitness and endurance training, while the CR10 scale is often preferred for more sensitive clinical evaluations, such as in cardiac rehabilitation or respiratory testing. Understanding the precise structure and application of each scale is crucial for accurate interpretation of perceived exertion data.

Rating of Perceived Exertion (RPE 6-20)

The RPE 6-20 scale is anchored with verbal descriptors corresponding to specific numbers, helping the subject calibrate their perceived effort. The scale spans from 6 ("No exertion at all") to 20 ("Maximal exertion"). Key points along the scale include 9 ("Very light"), 13 ("Somewhat hard"), and 17 ("Very hard"). The primary function of this scale is to capture the overall or central sense of effort and fatigue, reflecting the combined strain on the cardiovascular, respiratory, and musculoskeletal systems. Its design ensures that the subjective rating is highly correlated with objective physiological variables across a broad population, making it exceptionally reliable for predicting metabolic indicators and cardiovascular load.

The RPE 6-20 scale is particularly valuable in exercise prescription because it allows trainers and clinicians to set target zones based on perception rather than strictly measured heart rate. For instance, prescribing exercise at an intensity corresponding to RPE 12-14 ("Somewhat hard" to "Hard") ensures the individual is working within the moderate to vigorous intensity range.

recommended for cardiovascular fitness, regardless of individual variations in resting heart rate or the influence of medications like beta-blockers, which artificially lower the heart rate response to exercise.

Category-Ratio Scale (CR10)

The CR10 scale, or Borg CR10 Scale, utilizes a 0-10 rating system, where 0 represents "Nothing at all" and 10 represents "Extremely strong/maximal." Unlike the 6-20 scale, the CR10 scale often includes anchoring points above 10 (such as "Maximal") to account for sensations that exceed normal maximal effort, providing flexibility in measuring acute pain or dyspnea crises. The CR10 scale is mathematically designed as a ratio scale, offering enhanced precision when comparing relative differences in symptom intensity.

The principal advantage of the CR10 scale is its ability to monitor specific, local sensations and discomforts, rather than just global exertion. This is crucial in clinical assessment where monitoring fatigue, dyspnea (shortness of breath), muscle pain, or chest pain must be precise and localized. For example, during pulmonary rehabilitation, a patient might report a moderate RPE (12) but a high CR10 rating (7) specifically for dyspnea, indicating a respiratory limitation that needs targeted intervention. This specificity makes the CR10 scale an invaluable diagnostic and monitoring tool in both clinical exercise testing and rehabilitation programs.

4. Reliability, Validity, and Applications

Scientific literature overwhelmingly supports the reliability and validity of the Borg Scale. The scale exhibits high **concurrent validity**, meaning that the subjective ratings provided by subjects consistently correlate strongly with objective physiological variables measured simultaneously, such as oxygen uptake, heart rate, ventilation rate, and blood lactate concentration. This robust correlation confirms that the scale truly measures physiological strain. Furthermore, the scale demonstrates excellent **test-retest reliability**; when subjects are tested under identical conditions, they typically provide very similar ratings of perceived exertion, indicating consistent internal measurement.

The applications of the Borg Scale are extensive, spanning competitive sports, general health and wellness, and critical clinical management. In **athletic training**, the scale is used for periodization and optimizing training loads. Athletes use RPE to gauge workout intensity, ensuring they hit required effort levels during high-intensity days or remain within recovery zones during low-intensity sessions. This subjective measure helps prevent overtraining and allows for immediate adjustments based on daily fatigue or stress levels.

In **clinical rehabilitation**, particularly cardiac and pulmonary programs, the Borg Scale is often the primary method for safe exercise prescription. For patients who may have impaired cardiovascular

responses or are taking medications that blunt their heart rate, relying solely on heart rate targets is dangerous or misleading. The Borg Scale allows clinicians to prescribe exercise intensity based on the patient's perceived effort, ensuring they achieve therapeutic benefits without exceeding safe thresholds. The scale effectively applies to athletes engaged in competitive sports as well as to patients undergoing exercise training and rehab, bridging the gap between high performance and therapeutic recovery.

5. Limitations and Methodological Challenges

Despite its broad utility and strong scientific backing, the Borg Scale is not without limitations. As a subjective measure, its effectiveness relies heavily on the individual's ability to accurately perceive and report their exertion, which can be influenced by various psychological and methodological factors. The scale inherently assumes a linear relationship between physiological effort and subjective sensation, which may not hold true across all populations or under extreme conditions.

One major methodological challenge is the need for proper **anchoring and instruction**. If a subject is not properly instructed on the meaning of the numerical descriptors and anchored to examples of "maximal effort" before testing, the validity of their ratings may be compromised. Children, individuals with cognitive impairments, or highly competitive individuals determined to push beyond maximal perceived effort often require specialized training to use the scale effectively. Furthermore, psychological states such as anxiety, motivation, or distraction can temporarily skew ratings, leading to inconsistencies.

Another noted limitation, particularly concerning the CR10 scale, is the potential for a **ceiling effect** when attempting to measure truly supra-maximal or painful stimuli. While the CR10 scale attempts to address this by allowing verbal descriptors above the numerical 10, subjects sometimes struggle to differentiate between extreme maximal efforts (e.g., distinguishing between a 9 and a 10+). Additionally, differences in perceptual interpretation exist across diverse populations; sedentary or untrained individuals often report higher RPE for a given workload compared to highly trained athletes, requiring calibration based on fitness level.

Further Reading

[Borg Rating of Perceived Exertion \(Wikipedia\)](#)

[Borg Category-Ratio Scale \(ScienceDirect\)](#)

[The Borg Rating of Perceived Exertion \(RPE\) Scale: Research and Applications](#)