INTENSITY OF PHYSICAL ACTIVITY AND THE "TALK TEST"

A Brief Review and Practical Application

by Anthony L. Webster, B.Sc., M.Sc., Ph.D. and Susana Aznar-Laín, B.Sc., M.Sc., Ph.D.

LEARNING OBJECTIVE

- To provide some practical recommendations regarding how to prescribe exercise intensity using simple talk testing.

Key words:
Exercise Prescription, Perceived Speech Production Difficulty, Training, Guidelines, Health

The American College of Sports Medicine (ACSM) and the American Heart Association recently updated their physical activity recommendations for public health (1). The current guidelines now state that adults should obtain either at least 30 minutes of moderate intensity activity on 5 days each week or at least 20 minutes of vigorous physical activity on 3 days each week (1). Combinations of moderate and vigorous activity also can be performed to meet the recommendations (1). It is clear that vigorous intensity exercise provides even greater health and fitness benefits than moderate intensity, probably because of the greater increase in aerobic capacity (2). An article published in the September/October 2006 issue of this *Journal* by David P. Swain, Ph.D., FACSM, summarized this issue eloquently (2). As intensity is the most difficult variable of the physical activity prescription to measure and in view of its importance, it is essential that clear information is provided about how to prescribe and gauge, respectively, the intensity of physical activity.

The talk test (TT) is a frequently recommended method of regulating exercise intensity. However, only a few research studies have been performed on this topic, and there is a lack of clear information regarding how to apply this method in the field. Therefore, our objective is to briefly summarize the major studies done in this area and to provide some practical recommendations for two forms of the TT that can be used as simple and useful markers of exercise intensity.

TRADITIONAL METHODS OF MEASURING INTENSITY OF PHYSICAL ACTIVITY

Methods of monitoring intensity of physical activity fall into two basic categories: laboratory measurements (requiring equipment) and field measurements (requiring minimal or no equipment) (Table 1). Laboratory methods are objective measures such as a percentage of an individual's maximal oxygen consumption (%$\dot{V}O_{2max}$), measurement of energy expenditure, or measures of blood lactate or ventilatory parameters (where intensity is expressed relative to submaximal physiological "thresholds"). It also is possible to gauge exercise intensity objectively by monitoring external work rate, such as speed of running or power output in cycle ergometry or rowing. These techniques are undoubtedly the most valid and accurate, and although their precision and objectivity may be of importance in a research or clinical context, rarely is this necessary or practical in field settings.

For the results of laboratory exercise testing to be of more practical use, intensity prescriptions are usually connected to more easily measurable field measures such as heart rate or RPE. Traditionally, the use of heart rate as an estimate of training has been the common standard. Two approaches have been used to

TABLE 1: **Common Laboratory and Field Techniques for Measuring Intensity of Physical Activity**

Laboratory Methods	Field Methods
1. oxygen consumption	1. heart rate
2. submaximal physiological thresholds	2. metabolic calculations and tables (METs)*
-blood lactate kinetics	3. rating of perceived exertion
-ventilatory parameters	4. talk testing
3. rate of energy expenditure	
4. metabolic calculations and tables (METs)*	
5. measurement of power output/speed	

**METs may be used in both laboratory and field settings.*
MET indicates metabolic equivalent; RPE, rating of perceived exertion.

express intensity ranges in terms of heart rate: percentage of maximal heart rate (%HRmax) or percentage of heart rate reserve (%HRR) (3). Of these two approaches, %HRR is preferable to %HRmax because the former takes into account both an individual's resting and maximal heart rates (HRR = HRmax − resting heart rate) (2). For either approach, accurate knowledge of maximal heart rate will improve the precision of the resulting intensity ranges. The best method for gauging maximal heart rate is a maximal exercise test, but in most cases, it is estimated using a standard equation such as 220 − age, although considerable variability (SD, ±10 to 12 beats·per minute) is associated with such estimates (4). Despite the popularity of use of heart rate, it is important to recognize that it may be influenced by a number of factors other than work intensity (4). Such factors include environmental conditions that influence heat dissipation (especially heat, convective airflow, and humidity), the degree of rest or overtraining of the individual, stress, altitude, illness, and cardiac medications (4).

The RPE scale, despite its subjectivity, has become a valid tool in the monitoring of exercise training programs because it correlates well with blood lactate, heart rate, pulmonary ventilation, and the oxygen uptake responses to exercise (3). The RPE is particularly advantageous in situations where the heart rate response to exercise may be altered (*e.g.,* individuals on heart medications) or where there is little equipment (*e.g.,* heart rate monitors) or ability to measure heart rate manually. The major drawback to the RPE method is that the scale ideally needs to be visible to (or memorized by) the individual while exercising. Consensus exercise guidelines have typically referred to the original 15-category RPE scale, although a modified category-ratio RPE scale also is widely used (3).

Photo courtesy of Noll Laboratory, The Pennsylvania State University.

TABLE 2: **Classification of Physical Activity Intensity Using %HRR, RPE, Speech Difficulty, and Percentage of Resting Counting TT**

	Relative Intensity			
Intensity Descriptor	%HRR	RPE	Speech Difficulty†	% Resting CTT
Very light	<20	<10	speech is unaffected from rest	—
Light	20–39	10–11	comfortable speech is possible	>55
Moderate	40–59	12–13	speech possible with some difficulty	40–55
Vigorous/hard	60–84	14–16	speech limited to short phrases	30–40
Very vigorous/hard	>85	17–19	speech is very difficult	<30

†*Individual must speak aloud.*
RPE (15-point scale).
% resting CTT = % of CTT recorded during a resting state (based on results from Reference (15)).
CTT indicates counting TT.

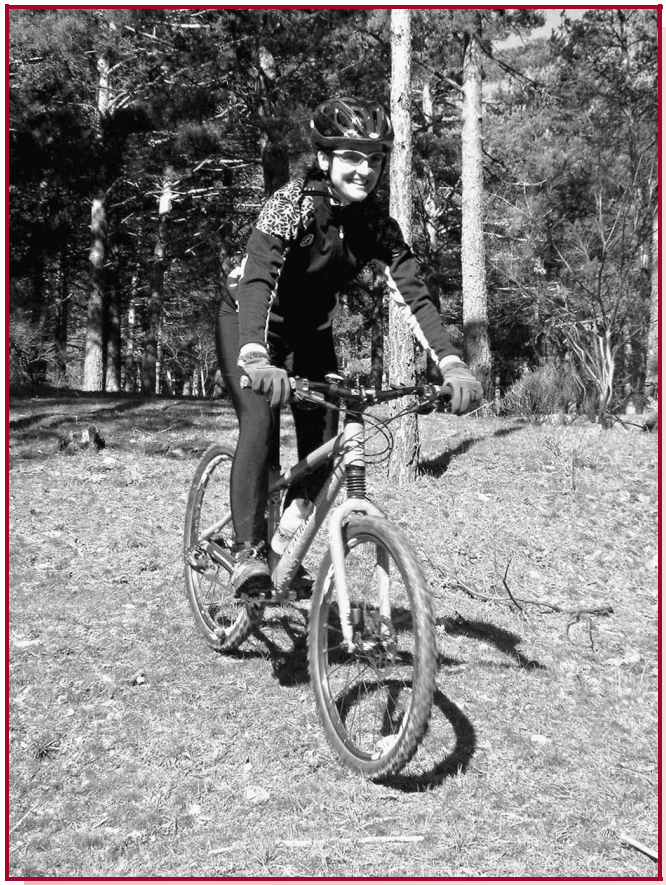
One further non–heart rate method is estimation of intensity *via* the use of metabolic calculations or tables listing the METs of various activities at different levels of intensity (4). Metabolic equivalents are most widely used in a clinical laboratory setting to indicate the metabolic response to exercise, but they also may be used to guide exercise intensity in the field.

From a public health perspective, expression of exercise intensity can be quite adequately expressed by the basic descriptor terms *light*, *moderate*, and *vigorous/hard* (Table 2). This has been apparent in the evolution and simplification of physical activity recommendations over the last two decades toward the widely accepted current guidelines (1). In Table 2, information is provided regarding standardization of intensity zones from "very light" up to "very hard" together with some guidelines as to how these may relate to speech difficulty and talk testing.

THE "TALK TEST" AS A MEASURE OF EXERCISE INTENSITY

For almost two decades, the basic TT has been recommended in some circles as a simple and subjective method of regulating exercise intensity (5). However, it has failed to gain widespread acceptance, largely because of vague descriptions in the literature. Examples of such descriptions include "…if you cannot carry out a conversation fairly comfortably while walking or jogging, you may be performing at a pace that is too intense for your level of fitness," (6) "…you should be able to carry on a conversation by piecing together short sentences without gasping for air," (7) and "…if the exercise intensity is sufficient so that the patient can just respond to conversation then the intensity may be just about right…" (8). A common thread through all these descriptions is that high levels of ventilatory control are required for comfortable speech and that if an individual is unable to talk comfortably during exercise, the intensity is likely to be above the ventilatory threshold. For many, this might represent an exercise intensity that may be excessive for their fitness level (5). The goal of the TT, therefore, is to select an intensity where comfortable speech is still just possible. In the mid to late 1990s, studies, in the form of research abstracts, began to emerge that suggested that the TT was a viable method of ensuring that exercise intensity fell within recommended guidelines for developing cardiorespiratory fitness, although concern was raised that some individuals exceeded intensity recommendations while using this technique. Dehart-Beverley et al. (9) hypothesized that the TT would be related to objectively determined ventilatory threshold in young healthy students and indeed found that this was the case. This finding was subsequently replicated by the same group in healthy adults, well-trained individuals (10), and patients with stable cardiovascular disease (11). In more recent studies, this group also has demonstrated that the TT is an appropriate guide of exercise intensity for cardiac patients both in the laboratory and in the field (12) and also that it can be used to ensure that they avoid exertional ischemia (13). In addition, the TT has recently been shown to be a consistent method of assessing intensity across different modes of exercise (8). Although the results of the above studies are encouraging, it must be noted that conclusions have been based on group average results and that there often is considerable variability in heart rate during exercise guided by the TT alone (SD of up to 22% to 23% of HRR (12)).

Photo courtesy of Susana Aznar-Laín, B.Sc., M.Sc., Ph.D.



Rotstein et al. (14) used a 13-level perceived speech production difficulty (PSPD) scale (1 [not at all difficult to speak] up to 13 [impossible to speak]) to ascertain speech difficulty in young healthy subjects during a graded incremental treadmill test to exhaustion. The study found that, although PSPD was tightly associated with heart rate, oxygen consumption, and ventilation, the PSPDs at each individual's ventilatory threshold were scattered widely across the PSPD scale. The authors therefore concluded that the TT may result in underestimation or overestimation of optimum training intensity for a significant number of individuals and that it was a questionable substitute for more objective measures of intensity such as heart rate.

Norman et al. (15) expanded on the traditional concept of the TT as a ceiling gauge and developed a more complex CTT where both lower and upper intensity limits could be ascertained. This test involved taking a deep breath and then

counting out loud, at the subject's normal pace, using the sequence "one–one thousand, two–one thousand, three–one thousand, etc." before having to take a second breath. This CTT procedure was first done at rest and then during exercise at various incremental exercise intensities. The highest complete count attained under each condition was recorded (a partial count such as "five-one…" before the second breath would not be included). The CTT count was obviously the highest during rest and progressively lower as exercise intensity (and the demand on ventilation) increased. Exercise intensity was then expressed as a percentage of the resting CTT count (%CTT), with higher %CTT representing lower exercise intensities and *vice versa*. These investigators found that, in a young healthy population, exercising between 30%CTT and 55%CTT was consistent with the ACSM recommendations for moderate-to-hard exercise intensities (40%/50% to 84% HRR or 12 to 16 on the RPE scale). For example, if the individual reached 13 ("thirteen–one thousand") at rest using the CTT method, their low-intensity target would be approximately seven ("seven–one thousand" or 55%CTT), and their high-intensity target would be approximately four ("four–one thousand" or 30%CTT). Higher CTT counts than "seven–one thousand" would represent an intensity that would be lower than recommended, and lower counts than "four–one thousand" would indicate a higher intensity than recommended. Further research on the CTT by the same group also has shown that it is well correlated with oxygen consumption in young healthy subjects. Although in need of further research, the CTT seems to be a useful tool that may allow intensity ranges to be ascertained through a simple verbal test.

Therefore, overall, the weight of evidence to this point suggests that "talk testing" is a useful subjective method for monitoring exercise intensity. For most of the general population, the TT alone will likely result in a training intensity consistent with current public health recommendations. However, given the concerns regarding individual variability, we suggest that, whichever type of TT is used, it should first be standardized against a target heart rate range for each individual. Some practical recommendations are discussed below.

HOW TO USE THE TWO FORMS OF TT IN THE FIELD

If a heart rate monitor is not available, individuals must first be instructed on how to measure heart rate manually, using either the radial or the carotid pulse. A resting heart rate may be taken to practice this procedure. An exercise heart rate range (*e.g.,* in most instances corresponding to moderate-to-vigorous physical activity) must then be calculated for the individual using the HRR method.

1. *Modified TT.* In the field, after a 5- to 10-minute warm-up, the individual should be instructed to gradually increase walking or jogging speed, depending on fitness level, until a steady-state heart rate within the moderate-to-vigorous range is reached. For unfit individuals or those unaccustomed to physical activity, it may initially be appropriate to select a heart rate within the lower end of this range, whereas for those more accustomed to physical activity, the higher end of the range may be used. At this point, the individual should recite a standard sentence or phrase aloud (such as the 31-word Pledge of Allegiance that is widely known to most Americans) and subjectively assess the level of speech difficulty associated with that intensity of exercise. This level of speech difficulty may then serve on its own as a simple gauge of "ceiling" intensity for future activity. The process should be repeated periodically as the individual adapts to the physical activity program.
2. *Counting TT.* In the field, after a 5- to 10-minute warm-up, the individual should establish a steady-state exercise heart rate toward the lower end of the target zone. At this point, the individual should take a deep breath and then count aloud ("one–one thousand, two–one thousand," etc.) at their usual talking speed. The highest complete count

Photo courtesy of Noll Laboratory, The Pennsylvania State University.

allowed before taking a second breath should be noted. A partial count ("five–one…") should not be included. If necessary, this process can be repeated more than once and an "average" count determined. The exercise intensity should then be increased until a steady-state heart rate has been obtained toward the higher end of the target zone, and the counting process should be repeated in an identical fashion. The counts associated with the low and high range can then be used to satisfactorily gauge a zone for future exercise intensity. The procedure should be repeated periodically as the individual becomes more fit. The CTT has a potential advantage over the TT in that it could be used to set multiple zones of exercise intensity, but additional research is needed to make that case.

CONCLUSIONS

The intensity at which physical activity is performed has important implications for subsequent health and fitness benefits. It is therefore important that the general public is provided with clear and simple guidelines about how to monitor exercise intensity. If first standardized against an objective measure such as heart rate, the TT and counting TT are very simple and useful techniques that may be used by most individuals to monitor intensity during recreational physical activities.

Anthony L. Webster, B.Sc., M.Sc., Ph.D., is currently an instructor within the Centre for Sport and Exercise Education at Camosun College, Victoria, Canada. He teaches in the area of exercise physiology and physical activity and health. His research interests lie in the area of exercise intensity and its effects on the aging process.

Susana Aznar-Laín, B.Sc., M.Sc., Ph.D., is a lecturer in exercise and health at the University of Castilla–La Mancha, Spain. Her research area focuses on measurement of physical activity in both diseased and healthy populations.

References

1. Haskell, W.L., I.M. Lee, R.R. Pate, et al. Physical activity and public health. Updated recommendations for adults from the American College of Sports Medicine and the American Heart Association. *Medicine & Science in Sports & Exercise*® 39(8):1423–1434, 2007.
2. Swain, D.P. Moderate- or vigorous-intensity exercise: what should we prescribe? *ACSM's Health & Fitness Journal*® 10(5):7–11, 2006.
3. American College of Sports Medicine. ACSM's position stand on the recommended quantity and quality of exercise for developing and maintaining cardiorespiratory and muscular fitness, and flexibility in healthy adults. *Medicine & Science in Sports & Exercise*® 30(6):975–991, 1998.
4. Heyward, V.H. *Advanced Fitness Assessment and Exercise Prescription*. 3rd ed. Champaign IL: Human Kinetics, 1998.
5. ACSM. *American College of Sports Medicine's Guidelines for Exercise Testing and Prescription*. 4th ed. Malvern: Lea & Febiger, 1991.
6. Rosato, F. *Jogging and Walking for Health and Fitness*. Englewood: Morton Publishers, 1995.
7. Douglas, B. *Your Personal Trainer*. Champaign: Human Kinetics, 1999.
8. Persinger, R., C. Foster, M. Gibson, et al. Consistency of the talk test for exercise prescription. *Medicine & Science in Sports & Exercise*® 36(9):1632–1636, 2004.
9. Dehart-Beverley, M., C. Foster, J.P. Porcari, et al. Relationship between the talk test and the ventilatory threshold. *Clinical Exercise Physiology* 2:34–38, 2000.
10. Recalde, P.T., C. Foster, K.M. Skempt-Arlt, et al. The talk test as a simple marker of ventilatory threshold. *South African Journal of Sports Medicine* 9:5–8, 2002.
11. Voelker, S.A., C. Foster, K.M. Skemp-Arlt, et al. Relationship between the talk test and ventilatory threshold in cardiac patients. *Clinical Exercise Physiology* 4:120–123, 2002.
12. Brawner, C.A., M.A. Vanzant, J.K. Ehrman, et al. Guiding exercise using the talk test among patients with coronary artery disease. *Journal of Cardiopulmonary Rehabilitation* 26(2):72–75; quiz 76–77, 2006.
13. Cannon, C., C. Foster, J.P. Porcari, et al. The talk test as a measure of exertional ischemia. *American Journal of Medicine in Sports* 6:52–56, 2004.
14. Rotstein, A., Y. Meckel, and O. Inbar. Perceived speech difficulty during exercise and its relation to exercise intensity and physiological responses. *European Journal of Applied Physiology* 92(4–5):431–436, 2004.
15. Norman, J.F., J. Kracl, D. Parker, et al. Comparison of the counting talk test and heart rate reserve methods for estimating exercise intensity in healthy young adults. *Journal of Exercise Physiology Online* 5:15–22, 2002.

CONDENSED VERSION AND BOTTOM LINE

The intensity at which physical activities are performed has important implications for health and fitness benefits. After initial standardization with heart rate, the talk test and counting talk test are very simple, safe, and useful subjective techniques that may assist recreational exercisers in monitoring the intensity of physical activity in field settings.