Comparing Intensity-Monitoring Methods

What are the most effective ways to control exercise intensity?

Intensity is by far the most important factor affecting increases in, and maintenance of, cardiorespiratory fitness throughout an exercise program, especially in highly fit individuals (ACSM 2000; Heyward 2002). Identifying the optimal level of intensity to give clients in their exercise program has been the focus of much research. Although we do not know the exact level of intensity that provides optimal health and fitness benefits, we do know where the optimal range lies. If we let clients exceed this optimal range, we may put them at risk for overtraining, cardiovascular complications or injury. If intensity is too low, clients will not benefit maximally from their program.

These issues are directly related to exercise program adherence. Clients may not enjoy an exercise program if they are sore, are overtrained or get injured because intensity is too high. On the other hand, clients can grow bored or disinterested with a program if intensity is below the optimal range and they aren’t improving. As you can see, setting the intensity range can be tricky and must be done carefully. This article looks at the various ways personal fitness trainers (PFTs) can monitor exercise intensity; which methods are more effective than others; and how they can be applied in a group versus individual exercise setting.

COMPARATIVE ANALYSIS OF INTENSITY-MONITORING METHODS

The optimal intensity range can be determined by a number of methods: % maximum heart rate (%HRmax), % heart rate reserve (%HRR), talk test and rating of perceived exertion (RPE), to name a few.

Heart Rate
One of the easiest and most common methods used to determine and track exercise intensity is heart rate monitoring. Heart rate is used because it is assumed to have a close relationship with oxygen consumption (VO2), which is the best measure of energy expenditure and exercise intensity.

%HRmax
%HRmax determines a target heart rate range by calculating percentages of maximal heart rate. The percent ranges for %HRmax are (55%–65%–)–90%. True maximum heart rate is usually not measured in the fitness setting, so a prediction formula must be used, such as 220 minus age. Once maximum heart rate is calculated, a percent range can be calculated based on the intensity level you want your client to maintain during exercise. In general, the low range of %HRmax (55%–65%) should be used for sedentary or less fit clients, who can benefit from lower intensities and longer durations of exercise. The higher range (70%–90%) should be used to enable fitter individuals to maintain or improve their fitness. Here is a quick sample calculation using this method:

Client #1:
Female, age = 55, sedentary, maximum HR = 165. Use 55%–65% HRmax.
Low end: 165 × 0.55 = 91 beats per minute (bpm)
High end: 165 × 0.65 = 107 bpm
Thus, the target heart rate range for this individual is 91–107 bpm.

%HRR
The %HRR, or Karvonen equation, is also a very common method used to determine intensity. The percent ranges for %HRR are (40%–50%–)–85%. Use the low range (40%–50%) for sedentary/low-fit clients and the high range (70%–85%) for more experienced exercisers. Unlike the %HRmax equation, this equation derives the target heart rate range from the “heart rate reserve,” not from the maximum heart rate. Heart rate reserve is calculated by subtracting resting heart rate from maximum heart rate. Since resting heart rate is taken into account, you will get a better estimation of your client’s heart rate training zone. Once heart rate reserve is calculated, multiply it by the percentages of choice and then add the resting heart rate back into each number. Here is an example:

Client #2:
Male, age = 40, active, maximum HR = 180, resting HR = 59. Use 70%–85 %HRR.
Heart rate reserve: 180 - 59 = 121
Low end: (121 × 0.70) + 59 = 144 bpm
High end: (121 × 0.85) + 59 = 162 bpm
Thus, the target heart rate range for this individual is 144–62 bpm.

Research supports the use of the %HRR method with older or more deconditioned clients because it is a more conservative approach and better estimates appropriate intensity training zones (Kohrt et al. 1998; Scharff-Olson, Williford & Smith 1992). According to Kohrt and colleagues (1998), the %HRRR method estimates intensity more accurately in younger individuals and overestimates it in older clients. However, owing to day-to-day variations in heart rate and error in the calculation of age-predicted maximum heart rate (220 minus age), using heart rate methods may lead to prediction errors in designing exercise intensity.

Rating of Perceived Exertion
RPE is a subjective measure of effort based on the combination of many factors: (1) physical conditioning and activity experience; (2) muscle and joint discomfort or pain; and (3) sensations of breathing and increased heart rate. The RPE range that can be used for all clients is 11–16 on the 6–20 Borg RPE scale (see Table 1). RPE is a perfect adjunct method to heart rate during exercise because PFTs must use standardized instructions when explaining how the scale is used and clients need...
practice rating their exertion during exercise. ACSM’s Guidelines for Exercise Testing and Prescription (ACSM 2000) outlines these instructions.

The Talk Test
The talk test is a simple method used to monitor breathing during exercise. The premise behind this method is that clients should exercise to a point at which they are able to get 3–5 words out per breath and hold a comfortable conversation. Above this point, clients begin to breathe heavily and may not be able to converse. Below this point, clients may be able to carry a tune, but they are not exercising hard enough. Research has demonstrated that the talk test is a valid measure of what physiologists call the ventilatory threshold (Dehart-Beverley et al. 2000).

In practical terms, when we exercise at or above the ventilatory threshold, we begin to breathe faster and more heavily, we breathe more through the mouth, and our ability to speak comfortably is greatly reduced. Also, when we exceed the ventilatory threshold, we lose our ability to exercise for a prolonged period of time, because we are relying more on anaerobic energy production.

Applying the talk test as an intensity-monitoring method is one of the most effective ways to individualize exercise intensity. It does not matter if your client is older/younger or fit/unfit, the events that occur at the ventilatory threshold are the same for everyone, even though the intensity level for ventilatory threshold will vary from client to client. If clients understand and can apply the concept of the talk test, they will know exactly how hard they are working and can adjust their intensity appropriately to remain compliant with the intensity guidelines you created for them.

GROUP VERSUS INDIVIDUAL EXERCISE
What is an effective way to set and monitor exercise intensity in the group setting? How about when working with an individual client? There are definite advantages to using certain methods for each setting. The following are recommendations for selecting effective methods to use:

RPE is equally effective as a monitoring tool in group or individual exercise settings. A group exercise instructor can instruct class participants to match their intensity to an RPE of 13–14 and can then ask for a rating periodically during exercise. The talk test, however, is easier to use with individuals or small groups. One way the group instructor can use the talk test is to have participants recite a specific phrase together and then rate their intensity based on the instructions for the talk test. Setting and monitoring heart rate in a group setting is not recommended, especially if heart rate is not used in conjunction with another method. It is extremely difficult for the instructor to effectively monitor and adjust intensity just by assigning a target heart rate range (e.g., 60%–70% HRmax). For example, some class members may feel comfortable exercising at 70%HRmax, whereas others will find it too difficult.

COMBINING METHODS FOR MONITORING EXERCISE INTENSITY
Can we combine methods to increase the effectiveness of the intensity-monitoring methods? The answer is a resounding yes! A good way to understand this is by remembering the “keyhole” analogy: If you were asked to describe a room by looking through a tiny keyhole, it would be difficult to get a picture of the whole room. But if you were able to peer through more than one keyhole, you would have a better idea of what that room looked like. The same is true for monitoring intensity. Using just one method to set and monitor intensity does not give you a complete picture of how intensely your client is exercising. By using multiple methods, you can get a better idea of the total intensity picture and have a better estimation of how hard your client is working. (See Table 2 on the next page for recommendations on combining intensity-monitoring methods.)

Each method has its own unique benefits and its limitations. By correctly combining methods, you can maximize the benefits of each and minimize their limitations. In general, it’s best to combine a subjective method (talk test or RPE) with an objective method (%HRmax, %HRR). This sets up a system of “checks and balances,” wherein one method supports another and vice versa. For instance, a client might be exercising one day at the lower end of her target heart rate range, but she tells you she is working hard at an RPE of 15. Based on her heart rate response, she might be pushed to exercise harder. However, her body is telling her that the intensity that day is just about right. The bottom line is that heart rate cannot tell you everything; you may need a backup method to help monitor your client’s exercise intensity.

FINAL THOUGHTS
In your client’s exercise program design, intensity is the most important factor because it has the most influence on cardiorespiratory fitness and overall program adherence. Intensity must be set very carefully, and client preferences taken into account, if you want to maintain
The most effective way to set and monitor intensity is to combine subjective measures with objective measures. This way, you have a system of checks and balances to ensure that clients follow the exercise intensity level you have given them and that you are monitoring them properly.

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References

### Table 2. Combining intensity-monitoring methods

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