How to Train for a 5K—What Does the Science Say?

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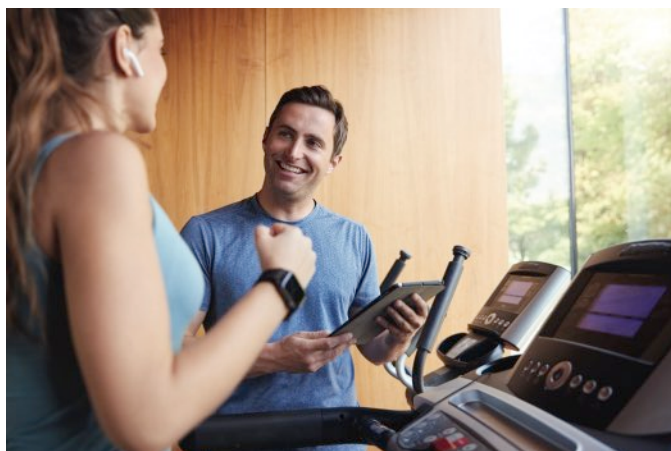
Apply It!

- This article provides a realistic and scientific approach for developing a 12-week training program for an intermediate-level recreational runner preparing for their first 5K race.
- The fitness professional should expect to gain knowledge on an effective field test used to determine initial fitness and estimate the lactate threshold.
- Rating of perceived exertion (RPE) is a valuable tool for prescribing endurance exercise to an intermediate-level runner. RPE is simple to use and relates to the three-zone intensity model.
- Using different tools, such as the Profile of Mood State Questionnaire, will help to monitor your client. This approach may assist in your prevention of overtraining and decreased motivation and may keep training exciting so that the client can meet their goals.

Key words: Endurance Running, Training, Programming, Intermediate, 5K Road Race

In the United States alone, about 60 million people participated in running, jogging, and trail running in 2017 (1). According to Clough and Maughan (2), people choose to run for a number of reasons, including mental well-being, social relations, challenge, and fitness/health. Challenge, as in a 5-km (5K) road race or marathon, is a major reason people enjoy running. It kindles a competitive drive seen in a lot of people. It also appeals to feelings of accomplishment and self-development when meeting that challenge. As a fitness professional, a client may ask you to design a training program for them as they gear up for a 5K recreational race. With a large amount of information on training elite runners, exercise professionals can use similar practices, while modifying the volume (the product of duration and intensity of training sessions), intensity (specifically the relative work, *e.g.*, rating of perceived exertion [RPE] or %HR_{max}), and frequency (number of sessions per day or week) of training (3) to fit your client's needs. This article uses an evidence-based approach to develop a 12-week 5K training program for an intermediate-level recreational runner. An intermediate runner has been described as an enthusiast who can run for 30 minutes, at least four times a week (4).

STEP 1: DETERMINE A RELEVANT INITIAL PHYSIOLOGICAL ASSESSMENT OF YOUR CLIENT

Field tests used to assess variables of running performance are often preferred because they are easy to perform and do not require laboratory facilities. The 30-minute time trial test examined by McGehee et al. (5) was found to be strongly correlated with laboratory measurements of lactate threshold. Lactate threshold represents the rapid rise in blood lactate concentration, above resting levels, during an exercise bout of progressively increasing intensity. Lactate threshold can be a practical and objective physiological marker for testing and training recreational exercise enthusiasts and competitive athletes. For the personal trainer to help train an intermediate runner, the 30-minute time trial test assists in determining training intensities based on running speed and RPE.

> **"Lactate threshold can be a practical and objective physiological marker for testing and training recreational enthusiasts and elite athletes. For the personal trainer, the 30-minute time trial test assists in determining training intensities based on running speed and RPE."**

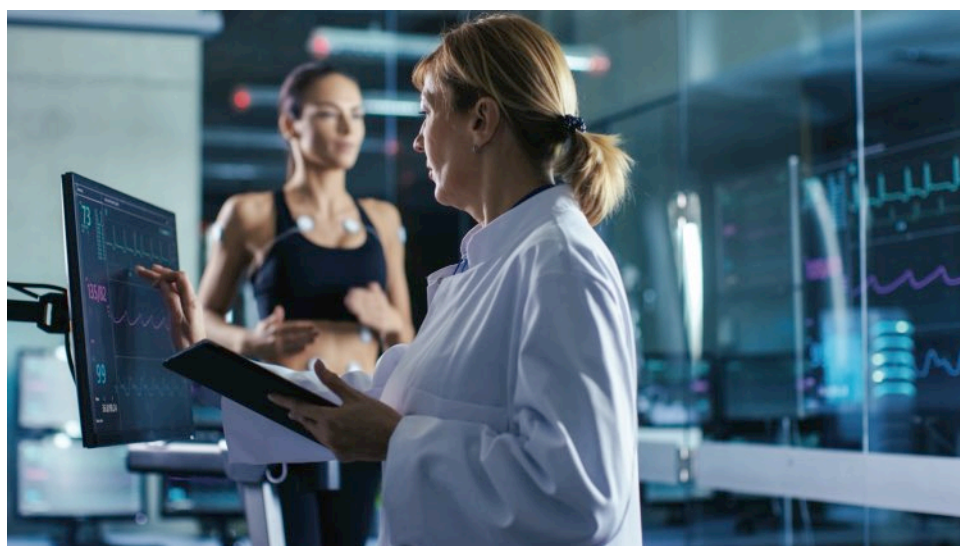## STEP 2: COMPLETING THE 30-MINUTE TIME TRIAL

The 30-minute time trial will be performed in a controlled setting, on a treadmill. Although weather and terrain may affect your client's performance if the test was administered outside, the controlled environment will help to accurately measure distance covered and running velocity achieved by your client. Although the 30-minute time trial protocol has been used to assess subelite and elite populations, there is a practical use in intermediate-level recreational runners. Because the test intensity is relative to the exerciser, running speed is self-selected and appropriate for each runner to complete the entire test. You will need a heart rate monitor and a treadmill to complete this 30-minute time trial. As explained by McGehee et al. (5), here are the steps to determine a client's heart rate, RPE, and running speed, which also may serve as an estimate of the client's lactate threshold.

1. Inform your client they are going to do a 30-minute time trial and you will be recording heart rate, RPE, and running speed. Share with your client the importance of initial testing:
   a. Choosing a specific test to monitor your client
   b. Developing a starting point to understand your client's fitness level
   c. Appropriately prescribing training based on the results of the initial test

In addition, explain the significance of performing the 30-minute time trial test to estimate running speed and RPE at their estimated lactate threshold, how these variables will be used in developing their own individualized training program. You will use a 1- to 10-point RPE scale: 1 being the feeling of sitting down and 10 being an all-out maximum effort. The 1- to 10-point RPE scale is easy for recreational exercisers to understand and also has been used in literature to prescribe/monitor training of seasoned marathoners using lactate threshold zones (6).

2. Before testing, have your client sit for 5 minutes while wearing a heart rate monitor. Record the lowest heart rate within a 5-minute period. A baseline measurement of the client's heart rate will provide a reference point for the test.
3. Have the client put on the heart rate monitor and do a self-selected warm-up for 5 to 10 minutes. Jogging on the treadmill at an RPE of 2 to 3 followed by performing dynamic lower body range of motion stretches will help the client prepare for the test. In addition, this warm-up can be used before the high-intensity sessions mentioned later in this article.
4. Set the grade of the treadmill at 1% grade. This has been shown to be closely associated to actual ground running conditions when testing endurance-trained athletes (5).
5. Instruct the client to run at their maximal sustainable running pace for 30 minutes. Tell the client that they can alter the speed any time during the 30-minute time trial.
6. Record the speed, heart rate, and RPE every 5 minutes during the 30-minute test.
7. Using the values at each 5-minute interval, average the heart rate and RPE. Note that the average running speed

can be calculated by dividing the total time by the distance covered (*e.g.*, 30 minute/3 miles = 10 minute/mile).

8. The heart rate and the RPE averages will be used to determine training intensity. In addition, this initial trial will be compared with the "retest" values during week 6 of the sample training program provided below.

STEP 3: DEVELOPING THE TRAINING PROGRAM: WHAT DOES SCIENCE SAY?

A three-zone intensity model has been reviewed in the literature (7) and used by elite runners to develop a training plan (8). Although Seiler and Kjerland (9) studied cross-country skiers, their work was based on previous literature discussing the distribution of training in rowers, cyclists, and marathoners using a three-zone model. As such, they describe each zone as the following: zone 1 (Z1) is a low lactate zone, zone 2 (Z2) is a lactate accommodation zone (where blood lactate production is elevated and lactate removal rates restore equilibrium), and zone 3 (Z3) is a lactate accumulation zone, where blood lactate production exceeds lactate clearance rates (6). In Z3, muscle fatigue is usually imminent because of the high intensity of exercise (relative to the person's fitness status) in this zone. It is at Z3 that the exerciser is at or above the respiratory compensation point (point during lactate acidosis where ventilation is increased at a faster rate).

Typical types of training sessions such as easy runs, lactate threshold runs, and interval workouts fall into Z1, Z2, and Z3, respectively. Easy runs lasting 20 to 30 minutes (Z1) are used for gaining and maintaining fitness. Lactate threshold runs (Z2), referred to as "tempo" runs (10), are sessions of continuous running (lasting 10 to 20 minutes) at a sustained submaximal pace for a given distance or duration. These tempo runs help to build endurance at a slightly elevated running pace. Interval workouts, often referred to as high-intensity interval training, completed in Z3 serve as an overload for the client. Typical interval sessions in Z3 involve short-duration bouts (1 to 5 minutes) of high-intensity work, separated by active recovery (*i.e.*, walking or jogging) periods of similar to longer duration.

Observing the training habits of elite runners, Esteve-Lanao et al. (8) found that better race performance times were correlated with training, which consisted of 80% of time spent below the ventilatory threshold (Z1) (ventilatory threshold and lactate threshold have been observed to be closely associated [6,8]) and 20% of time spent near the ventilatory threshold (Z2) or above (Z3). For example, if a client is performing 100 minutes of running a week, 80 minutes could be divided into four 20-minute runs at Z1, with two 10-minute sessions of moderate to high intensity at Z2 and Z3, respectively. Esteve-Lanao et al. (10) showed, in a separate study of 12 competitive subelite male runners, that this 80:20 approach (roughly 80% in Z1, 10% in Z2, and 10% in Z3) was more effective in improving time trial performance (10.4-km running bout) compared with a group using a 65:35 approach (roughly 65% in Z1, 25% in Z2, and 10% in Z3). In a small group of recreational endurance-trained runners, it was observed that ~76% of training was spent in Z1, at a low intensity, suggesting that training in recreational runners may follow a similar pattern to that used by elite endurance runners (6). It should be mentioned that other training ratios also may produce different but positive results, emphasizing that no one *absolute* training model exists. For example, the five-zone training models used by some competitive runners allow for very specific differentiation between intensity zones; zone 1 being very easy/recovery sessions and zone 5 being all-out efforts above blood lactate accumulation. However, for a recreational runner, the streamlined

TABLE 1: A 12-Week Training Plan for a 5K Race

Week	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday	Weekly Total
1	30 minutes (Z1)	20 minutes (Z1)	Rest	30 minutes (Z1)	30 minutes (Z1)	Rest	40 minutes (Z1)	150 minutes
2	30 minutes (Z1)	20 minutes (Z1)	Rest	30 minutes (Z1)	30 minutes (Z1)	Rest	40 minutes (Z1)	150 minutes
3	30 minutes (Z1)	20 minutes (Z1)	Rest	30 minutes (Z1)	30 minutes (Z1)	Rest	40 minutes (Z1)	150 minutes
4	25 minutes (Z1)	30 minutes (Z3: Fartlek)	Rest	25 minutes (Z1)	25 minutes (Z1)	Rest	45 minutes (Z1)	150 minutes
5	30 minutes (Z1)	15 minutes (Z3: Fartlek)	Rest	30 minutes (Z1)	20 minutes (Z2: tempo)	Rest	55 minutes (Z1)	150 minutes
Retest/ rest week 6	Rest	Test (40 minutes total)	Rest	20 minutes (Z1)	20 minutes (Z1)	Rest	40 minutes (Z1)	120 minutes
7	30 minutes (Z1)	15 minutes (Z3: Track Session)	Rest	30 minutes (Z1)	20 minutes (Z2: tempo)	Rest	55 minutes (Z1)	150 minutes
8	25 minutes (Z1)	15 minutes (Z3: Track Session)	Rest	30 minutes (Z1)	20 minutes (Z2: tempo)	Rest	60 minutes (Z1)	150 minutes
9	25 minutes (Z1)	15 minutes (Z3: Track Session)	Rest	25 minutes (Z1)	25 minutes (Z2: tempo)	Rest	60 minutes (Z1)	150 minutes
10	25 minutes (Z1)	15 minutes (Z3: Track Session)	Rest	25 minutes (Z1)	25 minutes (Z2: tempo)	Rest	60 minutes (Z1)	150 minutes
11	25 minutes (Z1)	15 minutes (Z3: Track Session)	Rest	25 minutes (Z1)	25 minutes (Z2: tempo)	Rest	60 minutes (Z1)	150 minutes
12 (race week)	Rest	25 minutes (Z1) and 4 20- second sprints	25 minutes (Z1)	20 minutes (Z1)	20 minutes (Z1) and four 10-second sprints	Race	Rest	~100 minutes

TABLE 2: Example Training Sessions

Type of Run	Example Session	Purpose	RPE
Easy run (Z1)	20 minutes jog/run	Runs done in Z1 build fitness and allow for recovery between hard training sessions	<4
Tempo run (Z2)	20 minutes total (not including warm-up and cool-down): 5 minutes warm-up jog 2.5–3 miles (intensity, Z2)–5 minutes cool-down jog	Steady training at or around lactate steady state (Z2) for racelike practice	4–5.5
Fartlek (Z3)	30 minutes total: 6 minutes warm-up jog–6 sets of 2 minutes reps at Z3 intensity, with 1 minute jog recovery (Z1) between reps–6 minutes cool-down jog	High-intensity interval training for building endurance	>5.5
Track interval (Z3)	15 minutes total: 5 minutes warm-up jog–four 400 meter runs on track (Z3) with 90 seconds walk rest between runs–5 minutes cool-down jog	High-intensity interval training for building anaerobic capacity and comfort/experience on pacing	>5.5

three-zone model works nicely with distributing training between below lactate threshold, at lactate threshold, and above lactate threshold for easier comprehension.

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STEP 4: 5K TRAINING PLAN

A sample training plan for an individual running 150 minutes per week can be found in Table 1. Determining what best suits your client may require adjusting this sample training plan. Notice the inclusion of a "retest/rest week" (at week 6); during this week, the 30-minute time trial is used as a midpoint assessment of the client's fitness level. The retesting of the client provides insight into how they are responding to training. By comparing the results of the retest to the initial test, the exercise professional can evaluate if the client has improved or if adjustments need to be made to the training program. One suggestion to evaluate for improvement is with average running speed and distance covered during the 30-minute test. Here's an example: if the pretraining average running speed (calculated by dividing the total time by the distance covered 30 minute/3 miles = 10 minute/mile) were to change to 30 minutes/3.5 miles = 8.6 minutes/mile at your midpoint testing point, you would have an objective assessment of improvement in running speed. Adjustments can include altering certain training variables (i.e., volume, intensity, and frequency) depending specifically if your client feels they are not being challenged or are working too hard. If you are observing the volume of "week 1" in Table 1, you will observe that your client spent 150 minutes (duration) in Z1 (intensity). Frequency refers to the amount of sessions being completed each day/week as well as the type of sessions being completed.

Regarding intensity, it will be practical to prescribe work in a relative form (e.g., RPE). Please describe to your client the RPE values for the different training zones: Z1 = RPE <4; Z2 = RPE 4 to 5.5 and Z3 = RPE >5.5 on the 1 to 10 RPE scale (6). Please see Table 2 for some example training sessions.

Sidebar 1: Example training log from week 5 of the training plan

Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday	Weekly Total
Session: easy run (Z1) Duration: 30 minutes RPE: 3 TIZ: 30 minutes in Z1 "Tired today"	Session: Fartlek (Z3) Duration: 15 minutes RPE: 6 TIZ: 15 minutes in Z3 "Felt smooth"	Rest, no run	Session: easy run (Z1) Duration: 30 minutes RPE: 3 TIZ: 30 min in Z1 "Recovered from Tuesday"	Session: tempo run (Z2) Duration: 20 minutes RPE: 5 TIZ: 20 minutes in Z2 "Motivated through session"	Rest, no run	Session: easy run (Z1) Duration: 55 minutes RPE: 3 TIZ: 55 minutes in Z1 "Energetic"	Total duration: 150 minutes TIZ Z1: 115 minutes (~77%) TIZ Z2: 20 minutes (~13%) TIZ Z3: 15 (10%)

TIZ, time in zone.

STEP 5: MONITORING TRAINING

Documenting the client's training sessions helps to gather valuable insight into the training program, including how the client is developing over the duration of their training (see Sidebar 1 for an example of the week 5 training log). The RPE scale is an effective method in determining exercise intensity of individual sessions, as it has been shown to correlate with the three-zone model (6). In addition, totaling the duration and RPE of sessions across different days will help fitness professionals determine the training volume of your client and the frequency to which they are completing easy/hard sessions. Monitoring will help to observe if the client is attaining an approximate 80:20 ratio of time spent in each zone. Personal trainers may wish to encourage the client to include subjective observations (*i.e.*, "I felt tired today," "Today I had a lot of energy," etc.) as this provides meaningful feedback about the training program and may help to create personal involvement in the training process. In addition, a monthly Profile of Mood State (POMS) Questionnaire can be administered online to further understand how your client is feeling (11). Often, as exercise professionals, we tend to overlook the psychological impact on performance. The POMS can help the exercise professional to guide the client on their training days by adjusting easy and hard sessions to best serve the exerciser.

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CONCLUSION

Developing a training program for a client completing their first 5K race is an exciting opportunity for a fitness professional. The three-zone intensity model introduced in this article is an evidence-based strategy to follow. Remember to track your client's workouts so you can discuss with them how they are progressing and improving. Go for it!

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BRIDGING THE GAP

Developing a training program that is based in science is useful for both the exerciser and the fitness professional. Presented in this article are effective and practical methods 1) to initially access the exerciser's fitness, 2) to develop a 12-week program that has been shown to be effective in elite and recreational runners, 3) to monitor the training of the exerciser on a week-to-week (RPE) and month-to-month basis (POMS), and 4) to retest the exerciser to observe fitness gains and the exerciser's response to the training program. Using these tools together can help prepare a beginning runner for their first 5K race