High Intensity Interval Training (HIIT) Program

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INTRODUCTION

HIIT is a frequently applied training method in athletes, leading to improvement in endurance performance and in intermittent (stop-and-go) sports as well. We have used the AlterG Anti-Gravity Treadmill to design a HIIT program at supramaximal speeds for runners, which would enable them to train at "unknown" speeds for them. "Overspeed" running could help trigger neuromuscular adaptations due to this new type of stimulus.

GOALS

Improving performance in running is the goal all runners want to achieve. The training required to get better is also linked with a higher risk of injury due to the extra load on the musculoskeletal structures. This HIIT program aims to:
- stimulate maximal metabolic and neuromuscular adaptations
- reduce injury risk during HIIT sessions
- improve running performance

HISTORY/PROGRESSION

There are many different types of HIIT programs for runners, but research has shown that 3 to 5 minutes intervals at a speed known to elicit VO2max (called vVO2max) will stimulate maximal metabolic rate, and bring performance benefits.

A study we conducted showed that at 85, 90 and 95% body weight (BW) on the AlterG, maximal metabolic rate was similar compared to a regular treadmill test, except for the speed at VO2max (vVO2max), which increased as BW decreased.

The following training program was designed to get the same metabolic load during the interval sessions as on a regular treadmill, with the difference being the speed at which the intervals are run. This is where the "overspeed" part is applied.

In order to start the program, we need to know the vVO2max of the runner, which can be either measured in a laboratory test, along with the actual VO2max, but it can also be fairly well approximated from a field test (or you may know the result already).

Field test: Run 1 mile the fastest you can, or take your most recent 1 mile PB. Determine what average speed you ran at (1/number of seconds of running * 3600 = your speed in mph).

Example: 1 mile in 5 minutes: 1/300sec * 3600 = 12 mph
Calculate speed to use on the AlterG: add 10% to the value obtained in the field test: 12 *1.1=13.2 mph.
This will be the speed you will run your intervals at, on the AlterG at 85% BW.

The HIIT Program is designed over 6 weeks (10 to 12 sessions).

RESULTS

We ran this program with top age-group athletes and obtained very good results, as far as performance goes. Performance improved by an average of 3.3% over 4 weeks, which is quite significant. If you run a 10k PB in 40 minutes, this equals to a 90 seconds improvement.

This type of improvement in performance can also be achieved with a traditional HIIT program on the track or on a regular treadmill, although our runners on the AlterG improved more than the ones running on a regular treadmill. So what's new here? The problem with repeated HIIT sessions is the risk of injury and the overall stress it imposes on the musculoskeletal system. Stress is good and necessary to elicit the much wanted adaptation in our cells (muscles, cardiovascular organs, intracellular function, soft-tissue resistance), but as often goes, too much can lead to long-lasting injuries.

Runners on the AlterG Anti-Gravity Treadmill can perform 2 sessions a week of HIIT with limited stress and controlled loading of these various musculoskeletal structures. In other words, it seems that the lowering of BW, even though the speed is increased, contributes to optimal loading. Our AlterG runners felt the session was not too hard on their muscles, tendons and joints, which was not the case with runners doing a similar program on a regular treadmill. We also noticed that lactate levels were a bit lower at the highest of intensities in the AlterG, which could also be the reflection of a slightly different strain on muscular tissue.

PROGRESSION TABLE

This HIIT program is the one we would suggest for a runner who has a mile PB of 5 minutes. We use the following baseline values to determine the protocol parameters:
- vVO2max = 12 mph
- Interval running speed in AlterG = 13.2 mph
- Duration of interval: Start with 2 min and progress according to plan
- Always start with 10 minute warm-up or personal routine before speed workout.
- First session is run at 85% BW, before progressing to 90% BW in session 2. The last session is meant to be run at 95% BW.
- First interval of each session can be started 0.5-1.0 mph slower and target speed reached after 1 minute

2 HIIT sessions a week (for athletes with at least 4 session a week usually)

Week	Session	Speed (mph)	BW (%)	Incline (%)	Number intervals	Interval duration (min)	Recovery duration (min)	Total time (min)
1	1	13.2	85%	0%	4	2:00	2:00	16:00
	2	13.2	90%	0%	4	2:15	2:15	18:00
2	3	13.2	90%	0%	4	2:30	2:30	20:00
	4	13.2	90%	0%	5	2:30	2:30	25:00
3	5	13.2	90%	0%	5	2:30	2:30	25:00
	6	13.2	90%	0%	5	2:30	2:30	25:00
4	7	13.2	90%	0%	4	2:45	2:45	22:00
	8	13.2	90%	0%	5	2:45	2:45	27:30
5	9	13.2	90%	0%	5	2:45	2:45	27:30
	10	13.2	90%	0%	5	3:00	3:00	30:00
6	11	13.2	90%	0%	5	3:00	3:00	30:00
	12	13.2	95%	0%	4	2:30	2:30	20:00

The interval duration is rather conservative in this model, and some runners may find it fairly easy at the beginning. If that is the case, try to increase each interval duration by 30 to 60 seconds. To individualize even more, you can run the following trial before the training begins: warm-up, then bring quickly the speed up to 13.2 mph (or your target speed as calculated above) and run as long as you can at that speed. The time you are able to maintain it will determine you interval duration, which 60% of that time:

Example: 06:00 minutes at 13.2 mph * 60% = 03:36 minutes for intervals. In the table, start with 03:00 minutes intervals and work your way up to 04:00 minutes

ADAPTATION TO YOUR LEVEL AND TRAINING LOAD

We recommend no resistance (weight-lifting) exercises for lower body muscles during the program.

If you do not feel comfortable after warm-up or the first interval, cancel the session and do not make up for it. If you have 12 sessions in your table, it is just as good to do 10 sessions over the 6 weeks. Injuries happen when too tired or not recovered enough.

1. Athletes running 3 times a week: run the program for 8 weeks, with one session per week, alternate table looks like this: Other training sessions in the week would include at least one easy pace (base endurance) and the second one could include a bit of pace variation, but nothing above threshold pace (10k pace)

2. Athletes running 4-5 times a week: run the 2 interval sessions per week and make sure there is very little intensity in the other workouts. Go easy on the days after the intervals, days off are even better.

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1	13.2	85%	0%	4	2:00	2:00	16:00
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3	13.2	90%	0%	5	2:15	2:15	22:30
4	13.2	90%	0%	5	2:30	2:30	25:00
5	13.2	90%	0%	4	2:45	2:45	22:00
6	13.2	90%	0%	5	2:45	2:45	27:30
7	13.2	90%	0%	5	3:00	3:00	30:00
8	13.2	90%	0%	4	2:30	2:30	20:00