



Interval test training model for junior martial artists

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Abstract

Objective of the study was to develop and test benefits of a new interval test training method with a progress test scale.

Methods and structure of the study. We were governed by the conceptual ideas of Gershler and Tabat in the new interval test training design. Generally the interval test training time depends on the amplitude and frequency of the pulse wave, with amplitude interpreted as the number of pulse zones with a preset frequency. The key formula is 6 interval test training = 8:52, where 6 is the number intervals in an interval test training cycle; amplitude of the pulse zones; and 8:52 is the interval test training time.

The study was run in the period of 09/01/2020 to 04/16/2021 at Tchaikovsky State Academy of Physical Culture where we sampled the 11-12-year-olds from the kickboxing and Thai boxing teams (n=30). We used Polar-10 heart rate monitors with Polar-Team software in the tests. In September we rated the individual heart rate maximums to find that the common formula 220-minus-age applies not to every athlete. The pulse zones were computed by the Polar-Team software automatically for every athlete based on the input heart rate maximums. The interval test training was designed using the following five pulse zones: Zone 1 (gray): 50-59%; Zone 2 (blue): 60-69%; Zone 3 (green): 70-79%; Zone 4 (yellow): 80-89%; and Zone 5 (red): 90-100% of the individual heart rate maximums.

Then we selected the most beneficial formulae for the Thai boxers' training depending on the training stages.

Results and conclusion. The new interval test training model was tested beneficial as it gives the means to control the load versus the actual individual fitness to prevent health risks. The training formats with application of the Polar-Team heart rate monitors were found to provide special progress motivations since every athlete could track own progress. Practical tests of the new interval test training model showed its benefits for competitive progress as verified, among other things, by the actual competitive accomplishments of the sample in the 2021 Ural-Volga Zone Kickboxing and Thai boxing Championship with the Tchaikovsky State Academy of Physical Culture teams ranked the first and second on the event scoreboard.

Keywords: interval training, interval test training, Hyksos tracker, high-intensity training, Tabata protocol workout, Polar H-10 heart monitor, Kicktest-100 dynamic bag, Polar-Team software.

Background. The interval training format is presently ranked among the most popular physical training methods and is known to include repeated workouts with the rest breaks customizable by distance, training time, repetitions, and heart rate variation range. Today interval training methods are traditional for virtually every sport discipline, with their alternating high- and low-intensity physical workouts with the distance and time controls. The commonly known linear correlation of the heart rate with the training intensity is widely used by the interval training control and management heart rate monitoring systems. It was in the early 1930s that German coach Waldemar Gershler made the first

attempts to control and manage interval training using the heart rate tests. His trainees alternated the 100-400m sprints with the heart rate up to 180 beats/min with the rest breaks to let it drop to 120 beats/min, followed by new sprints till the heart rate recovery time exceeded 90s to urge the training being stopped. This new format made it possible for the athletes to make world records in the 400m and 800m events.

A new interval training model was offered by Professor Izumi Tabata (Japan) in 1996 [5, 6]. He proved benefits of a 4-minute high-intensity workout four times a week prior to the regular 1-hour trainings five times a week. Every such workout included eight

**Table 1.** Individual performance rating scale applied in the interval test training

№	Interval test training formula	Scores, points			
		5	4	3	2
1	1 ITT _[1-5]	1-1:30min	1:30-2:30min	2:30-3:30min	3:30+min
	Hykso (strikes)	200+	150-200	120-150	120-
2	1 ITT _[5]	24+min	11-24min	6-11min	6-min
	Hykso (strikes)	2000+	1500-2000	1000-1500	1000-
3	6 ITT _[3-5]	4-min	4-5min	5-8min	8+min
	Hykso (strikes)	900+	850-900	750-850	750-
4	6 ITT _[2-5]	7-min	7-8min	8-9min	9+min
	Hykso (strikes)	1100+	800-1100	500-800	500-
5	12 ITT _[4-5]	5-min	5-6min	6-8min	8+min
	Hykso (strikes)	1000+	850-1000	600-850	600-
6	12 ITT _[3-5]	10-min	10-15min	15-18min	18+min
	Hykso (strikes)	2000+	1500-2000	1000-1500	1000-
7	12 ITT _[2-5]	14-min	14-18min	18-20min	20+min
	Hykso (strikes)	2500+	2000-2500	1500-2000	1500-
8	Burpee, count	80+	70-80	60-70	60-
9	Hykso (1-min strikes)	500+	400-500	300-400	300-
10	1-min striking power test	10+ tons	6-10 tons	3-6 tons	3- tons

20-second rounds with 10-second rest breaks jointly referred to as the Tabata Protocol. The keyword 'protocol' has become common since every workout is designed to attain an individual maximum and fix it in an individual progress record for the performance tracking, analyzing and improvement purposes.

Objective of the study was to develop and test benefits of a new interval test training method with a progress test scale.

Methods and structure of the study. We were governed by the conceptual ideas of Gershler and Tabat in the new interval test training design. Generally, the interval test training time depends on the amplitude and frequency of the pulse wave, with amplitude interpreted as the number of pulse zones with a preset frequency. The key formula is 6 interval test training [3-5]=8:52, where 6 is the number intervals in an interval test training cycle; [3-5] amplitude of the pulse zones; and 8:52 is the interval test training time: see Figures 1-2.

The study was run in the period of 09/01/2020 to 04/16/2021 at Tchaikovsky State Academy of Physical Culture where we sampled the 11-12 year-olds from the kickboxing and Thai boxing teams (n=30). We used Polar-10 heart rate monitors with Polar-Team software in the tests. In September we rated the individual heart rate maximums to find that the common formula 220-minus-age applies not to every athlete [1]. The pulse zones were computed by the Polar-Team software automatically for every athlete based on the input heart

rate maximums. The interval test training was designed using the following five pulse zones: Zone 1 (gray): 50-59%; Zone 2 (blue): 60-69%; Zone 3 (green): 70-79%; Zone 4 (yellow): 80-89%; and Zone 5 (red): 90-100% of the individual heart rate maximums.

Then we selected the most beneficial formulae for the Thai boxers' training (see Table 1) depending on the training stages. The interval test training formula in the Table refers to the punching bag trainings with Hykso trackers [2-4] with counts of strikes used as the key index for the performance rating scale. Furthermore we used 1 interval training [1-5] formula for the pre-training warm-up to rate the individual athletic fitness for the special core training on a 5-point scale. In case of a low rate in the 1 interval training [1-5] test, the athlete was either released of the training or offered an eased training scenario.

We used the interval test training 1 [5] formula for the shock test micro-cycles at the precompetitive stage to rate an individual competitive fitness. The interval test training (ITT) 6 [3-5], ITT 6 [2-5], ITT 12 [4-5], ITT 12 [3-5], and ITT 12 [2-5] formulae were used in different combinations in the core training stage with the punching bags and other training equipment, with the pulse curves applied as the key performance control tool (Fig. 1-2). The intervals were varied in numbers and times based on the pulse curve analyses. We also rated the individual performances using Burpee exercise from the Tabata Interval Training Protocol, with controlled repetitions and 1-min punching



bag (dynamic Kicktest-100) test to rate the individual performances in tons.



Figure 1. Individual ITT 1 [1-5], ITT 12 [2-5] and ITT 12 [3-5] tracks



Figure 2. Individual ITT 1 [1-5] and ITT 6 [3-5] tracks

Results and discussion. The new interval test training model piloting experiment with the training process controlled by the pulse zones and the interval frequencies found the individual performances depending on the actual fitness; with an interval test training formula selected for every athlete depending on the fitness level and the pulse curve analysis. The interval test training time was used as the key workload and current performance control index, whilst the Burpee test and 1-min dynamic bag tests used to rate the individual precompetitive fitness.

Conclusion. The new interval test training model was tested beneficial as it gives the means to control the workload versus the actual individual fitness to prevent health risks. The training formats with application of the Polar-Team heart rate monitors were found to provide special progress motivations since every athlete could track the own progress. Practical tests of the new interval test training model showed its benefits for competitive progress as verified, among other things, by the actual competitive accomplishments of the sample in the 2021 Ural-Volga Zone Kickboxing and Thai boxing Championship with the Tchaikovsky State Academy of Physical Culture teams ranked the first and second on the event scoreboard.

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