"Evolutionary" based periodization in a recreational runner

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Headline

Periodization is a topic in long and continuing interest in sport science. Recently, Mujika et al. (1) have presented a multifactorial approach to periodization, which integrates exercise training, recovery, nutrition, psychological skills and skill acquisition as key factors. In addition, Kiely (2) has suggested the necessity of realigning periodization philosophy with contemporary stress theory. Both approaches are in accordance with a previously published "evolutionary" perspective for training periodization (3). However, little or no published data exist on real world interventions with such approach.

Aim. The aim of this case report is to present data on an "evolutionary" based periodization model, in a recreational female runner who competed in 10 km and half-marathon road races over a competitive cycle of 20 weeks.

Methods

Athlete. A female recreational runner, 50 years of age (1.59 m; 50-52 kg) started to train with us in September of 2017. Previously, after a physically active youth and adulthood practicing various sports, she trained for and competed in triathlons, including Ironman length events, during the 2008 and 2009 seasons. During the 2010 season, her training focused on swimming and resistance exercises. Since 2011 until 2017, she trained only for road races with different coaches (no data available). During this period, her best performances were 39:40 in 10 km (2012) and 1:24:40 in half marathon (2012). During those years, she frequently trained twice a day. However, her performance times failed to improve through 2013-2017. In 2017, she completed a 10 km in 40:23 and a half marathon in 1:30:23, before starting the current training program. During this period, she was frequently injured, with stress fractures, tendinitis and plantar fasciitis. She gave her written consent for the use of her personal data.

Design. This is a single case report. Before the competitive period to be reported (20 weeks), the runner completed three months of a preparatory training plan that consisted on easy runs and fartlek (24-60 km/week), running techniques, aerobic exercises, and strength training (circuit resistance training), completing 40-90 min per session, 5-6 days a week, in a linear periodization fashion. During this period, she completed incremental tests on treadmill (VO_{2max} = 56 mL/kg/min) and on track (maximum aerobic speed [MAS] = 17 km/h), and 3 road races of 10-12 km for training pacing strategies. During this period, we evaluated her daily living activities, psychological profile, training preferences, recovery strategies, and nutritional habits, while familiarizing her with Rating of Perceived Exertion (RPE) scales, awakening HR recordings, and training readiness questionnaires for using them appropriately during the subsequent competitive period.

"Evolutionary" based periodization. During a period of 20 weeks, the runner completed 47-93 km/week and competed in two 10 km and 3 half marathons. The typical weekly microcycle (5-7 sessions) included 2 strength training sessions plus 20-30 min of submaximal uphill runs on treadmill; 1-2 running sessions of 'cruise intervals' (at or slightly below the competitive pace), and some intervals at MAS in the weeks before competitions. One designated recovery days, she performed 1-2 easy short runs or runs plus walks of 30-60 min, interspersed with some maximum speed progressions over 100 m; and a single long easy run of 70-100 min. The training intensity distribution was polarized (75-80/5/15-20), designed to minimize the time for glycolytic exercises. In addition to the intensity distribution being strongly polarized, there was an intentional pattern of hard days and easy days. This pattern has been shown to augment the training response (4, 5), and to allow maintenance of a low training monotony and strain score, which is related to reduced illness and injury (6). This was all consistent with the purported "paleo" or "evolutionary" pattern of activity (3). Ten to 15 days before competitions, training volume was progressively reduced (i.e. tapering) (7). Training workload was monitored with the modified training impulse (TRIMP) method described by Foster (6, 8).

Management of training loads and lifestyle habits were considered simultaneously for avoiding an excessive stress exposure, designed to optimize adaptations (3). Given that she had 3 hours of physical education classes 6 days a week, and a daily white-collar job of 8 hours, 5 days a week, modification of programmed training was performed on a daily basis based on: 1) hours and quality of sleep; 2) awakening heart rate variability (HRV) (9, 10); 3) motivation before training; 4) training responses; 5) course demands (e.g. exams); 6) job demands (e.g. extra hours); and 7) other life stressful events. When two or more of these variables suggested a possible negative adaptation or an excess of daily stress, the training workload was reduced, with a consensus between the athlete and us.

Nutritional advice was provided by a certified nutritionist for achieving micro and macronutrients requirements while avoiding processed foods. Intermittent fasting was completed only during short easy run days or resting days, while guaranteeing carbohydrate loading before and after intense training sessions and competitions (3).

Racing preparation included motivational talks about the focus during competition, and discussion on the best pacing strategies depending on her physical condition revealed during training, and on the race profile.

Recovery strategies included cold water immersion, compression sleeves and massage during the resting day of the weeks but only when she perceived an excess of muscle fatigue or 'heavy legs', and after competitions.

Statistical analysis. Mean weekly changes over the 20 weeks of the competitive macrocycle were calculated for training load parameters (6, 8). Percentages differences were calculated between personal bests in 2012 and current performances.

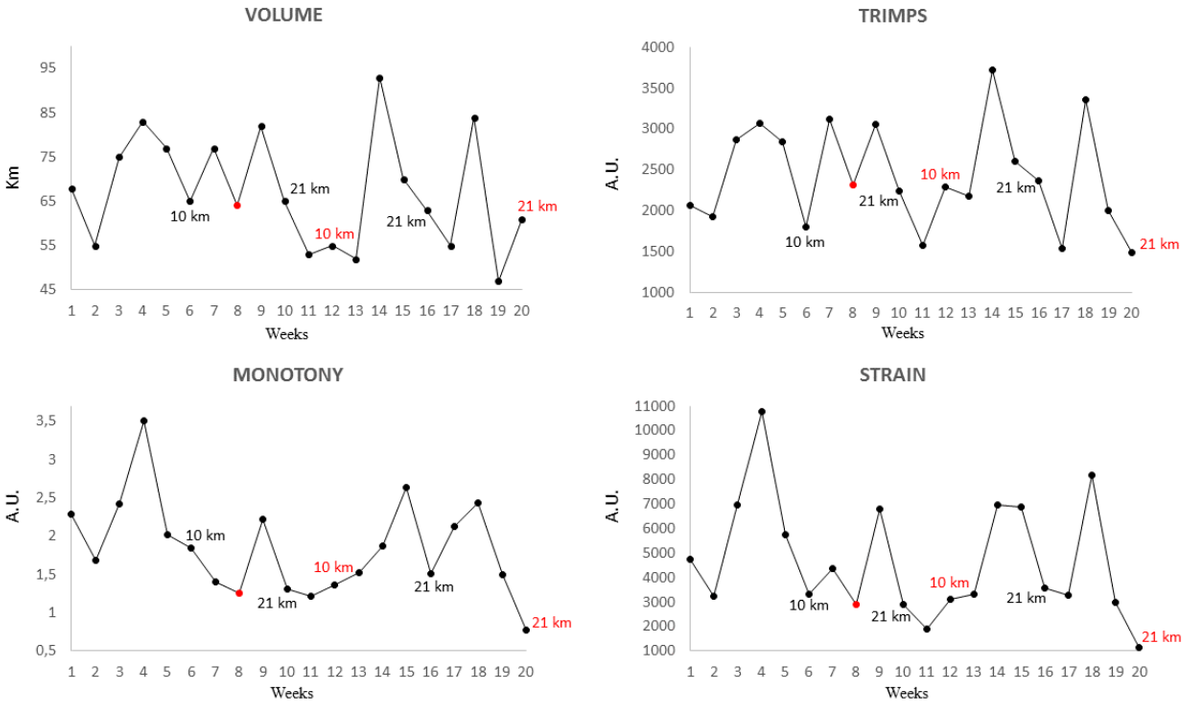

Fig. 1. Mean weekly changes over the 20 weeks macrocycle of training load parameters. Red labels indicate the best performances for 10 km and half marathon races. The red point indicates the flu sickness. A.U. = arbitrary units.

Table 1. Running performance during the competitive macrocycle (2018).

Week	6	10	12	16	20
Race	10 km	Half marathon	10 km	Half marathon	Half marathon
Performance tume (hours:min:s)	41:58	1:28:25	39:56	1:26:45	1:26:33
Mean Pace (min:s/km)	4:11	4:11	3:59	4:06	4:06
% of her best (2012)	92.4	95.7	99.3	97.6	97.8

Results

Performance times in the competitions are presented in Table 1. Changes in training parameters are presented in Figure 1. During the macrocycle, the runner did not have any training related injuries, except some discomfort in a toe, from week 13 to 20, as a consequence of an accidental blow with a table. At the end of week 8, she got sick with a flu, which caused 2 days of disrupted training. Her performances were essentially equivalent to her lifetime bests achieved during 2012.

Discussion

To the best of our knowledge, this is the first case report with a description of a multifactorial periodization following an "evolutionary" or "paleo" approach (3). In terms of health and performance, the outcomes are excellent since the runner improved her performance times compared to the recent years, but with a significantly lower training volume. Further, she did not experience any injury or symptoms of overreaching and overtraining. Given the expected age related decline in performance capacity (11), it would be suggested that the current performances are comparatively better than the previous ones (see Table 1).

It is impossible to definitely prove that the positive outcomes are related to specific characteristics of the current periodization. However, based on previous literature and athlete history, it could be speculated that the combination of a polarized training intensity distribution (12), distinct hard days and easy days (4, 5), low training monotony and strain (6), the management of stress resources (13, 14), and some diet-exercise strategies (15), could have contributed to positive training adaptations and better performances.

Evolution of training workload parameters occurred as expected with reduced training workload in terms of volume, TRIMPs, monotony and strain, particularly during the weeks of competitions. Interestingly, peak volume and TRIMPs, but not monotony and strain, occurred two weeks before best performances in half marathons. Given that competitive races were also included in training workload calculations, it may be also suggested that first races could also influence on subsequent ones.

Practical Applications

The current case report illustrates how some changes in periodization based on an "evolutionary" approach (i.e. polarized intensity distribution, hard day-easy day, low monotony and strain, stress-guided training and diet-exercise strategies) could be effective for improving performance and health in a middle-aged recreational runner.

Limitations

This is a case report and any inference should be taken with caution. In addition, road races are not homogeneous in terms of profile and climatic conditions therefore performance comparisons are difficult. However, the results are suggestive of the need for more observational, or even experimental, trials in higher performance level athletes. At the least, the results strongly support the "evolutionary" approach to training periodization (3).

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