TRAINING LOADS DURING THE MARATHON PREPARATORY PHASE - A CASE STUDY OF THE POLISH MARATHON RECORD HOLDER

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Abstract:

Aim. The main purpose of this study is to analyse the training loads of a competitive marathoner, the Polish marathon record holder. The analysis is based on 2 mesocycles with a duration of 8 weeks of the preparatory phase, guided by two different coaches. Moreover, another crucial issue included in the study is the comparison of the training framework and training loads during particular weeks.

Materials and methods. The practical implementation of the theory is provided with the use of research material from an Olympian, who is also the Polish marathon record holder, in the form of his workout logs. The content of the workout logs includes 2 marathon mesocycles, each with a duration of 8-week preparatory phases.

Results. Analysis of the volume of training loads in the 8-week mesocycle shows diversity between the two studied marathon preparatory phases. Considering the efficacy based on the race results, it should be said that the workout plan by the first coach turned out to be more beneficial for the marathoner.

Conclusions. It should be stated that it is the general running endurance which should be the main workout element of every elite runner. An increased number of kilometres definitely conduces the achievement of satisfactory marathon results. Moreover, one should bear in mind that most of the marathon work should be done regarding oxygen balance.

Introduction

In most disciplines, biological, psychological and training factors are decisive when it comes to sports level [1]. In the subject-research, the latter are most often mentioned, which together with psychological impact, may affect the sports result from 40%-50% [2,3]. The theory of sport training has also evolved over the past few decades. The development of physical culture sciences enriched by trainers’ experience contributes to this process. The combination of coaching experience aided by scientific knowledge and the adaptation capabilities of an athlete, results in outstanding sport results and development of the discipline or only a selected competition.

Training is an effective process when the applied loads are not detrimental to one’s health, when they develop an athlete’s skills and contribute to achieving success. Current competitive sport is characterised by the rationalisation of training. Its primary goal is to stimulate adaptation to achieve the best results at a given time, which is a measure of the effectiveness of the efforts made. To achieve the highest goal, an athlete’s form must achieve peak values during the most important competitions. The level of form results from biological...
movement abilities, the ability to resist fatigue and mental characteristics. A reliable way to achieve goals is to create a logically built training plan [4,5].

Obtaining the highest gratification is closely related to the body’s individual responses to given stimuli, which are the result of many years of training. The continuous increase of results at a master level requires constant analysis and evaluation of the organisational forms and methods of training [6,7].

With detailed records of the training plans for outstanding athletes, factual analysis may be performed. This is analysis that basically avoids programming errors and load planning. Contemporary sport is struggling with increasingly complex problems that affect sports performance. It is the most difficult to specify the issues regarding training loads. When looking for ways to optimise the training process, one should consider the type, size and structure of the load effectively influencing an athlete’s body. The vast range of training measures narrows with sports level, age and training experience. Only the right selection of resources and the proper time structure of training guarantee achievement of exceptional results.

The training process should be adapted to the current capabilities of an athlete and there should be no experimentation, especially when it concerns a high-level competitor [7]. A particularly important period in training work is direct start preparation (DSP), understood as a special pre-start sub-period lasting up to 8 weeks, the task of which is to create the highest start disposition of a competitor [5,8]. Therefore, the main task of this period is not to maintain sporting level, but to prepare an athlete for the start. Three phases are most often distinguished: reconstruction, intensification and super-compensation [5,8]. This is particularly applicable to advanced and highly qualified athletes [5,7]. This period is implemented in different ways depending on the discipline, competition, but also the athlete him/herself.

It is particularly important in endurance sports with a long duration of the starting effort, including marathons. DSP for marathon runs lasts about 8 weeks. This mesocycle, due to the specificity of marathon training, in which a competitor prepares for 2-3 starts regarding the main distance during a year, is of decisive importance for the achieved results. In research, it is shown that “the average speed in a training unit during a year and in the period of immediate preparation for the start” has the greatest impact on the result of the run [1].

Research aim

The aim of the study was to determine the relationship between training loads (volume, distribution of resources) in two, 8-week training mesocycles (DSP) and the result of a marathon run. In addition, characteristics of the pre-start week-microcycle in the tested DSPs were presented.

Research materials and methods

The subject of the study was H.S. (Photo 1) - multiple medallist of the Polish Senior Championships (5,000 m, 10,000 m, half marathon, marathon, cross-country running). He made his debut at the 2007 marathon in Dębno, winning second place in the Polish Championship. In 2010, he won a gold medal at the World Marathon Military Championships. On March 4, 2012 in Ōtsu, during the Lake Biwa marathon, he achieved 2:07:39 h., beating the nine-year Polish record for this distance. He participated at the 2014 Olympic Games in London and in the 2016 Rio de Janerio Olympics.

Photo 1. H.S. – athlete – two-time Olympian, record holder for Poland in marathon running (source: authors’ private collection)
The research material was the training documentation of the above competitor, a two-time Olympian, Polish marathon record holder, in the form of training diaries. The study includes data recorded for two, 8-week mesotrainings (DSP 1 - 15.08 - 9.10.2015, DSP 2 - 10.01 - 5.03.2016) ending with the marathon start.

Training units were described in accordance with the assumptions of sport theory and practice [9], and included:

- RE1 – running endurance at range 1 intensity (jogging, light running – training accumulation means);
- RE2 – running endurance at range 2 intensity (continuous run, cross – accumulation means);
- RE3 – running endurance at range 3 intensity (continuous run, running speed play (RSP) – training intensification means);
- RF – running force, which includes skips, multi-jumps, uphill runs;
- R – rhythm – accelerations at 80 m to 100 m high intensity sections;
- RSP – running speed play consisting of an introductory part, work on running technique and anaerobic-aerobic exercise of varying intensity repeated from several to several dozen times during the training unit;
- PE – pace endurance, which is characterised by start intensity.

The applied training measures were added up in 2 DSPs before the main starts and included: the number of training units broken down into microcycles, the volume of individual training measures expressed in kilometres including microcycles.

The study uses a research method that is a variation of the biographical method, called case study analysis [10,11], while maintaining its basic assumptions, but with the authors’ modifications adapting it to the needs of the work. The authors’ modifications concerned the reference method to study individual, accurate training sections and participation in sports competitions. It was aimed at presenting the differences or similarities of pre-start microcycles in the first and second of the analysed DSPs.

All calculations were performed using Microsoft Office Excel 2013. The results were presented in the form of figures and tables.

### Results

In Fig. 1 and Tab. 1, the participation of the athlete’s training means in preparation for the marathon in the two tested DSPs is presented in graphic form.

As it results from the presented data, the athlete completed a larger training volume in the first of the tested mesocycles, although the difference is small and amounts to 60 km throughout the DSP.

The greatest variation occurred in training means such as RE1 and RE3. In the first of the mesocycles, the athlete used RE1 means exceeding 200 km more, while

| Table 1. Volume of selected training means [km] in two, 8-week mesocycles of direct start preparation for H.S.’s marathon run |
|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|
|               | DSP1           |               |               |               |               |               |               |               |
|               | RE1           | RE2           | RE3           | RF            | R             | RSP           | PE            | Total         |
|               | 147           | 0             | 0             | 1             | 0             | 0             | 8             | 156           |
|               | 113           | 0             | 0             | 0             | 0             | 0             | 7             | 128.9         |
|               | 131           | 0             | 0             | 0             | 0             | 0             | 8             | 140           |
|               | 132           | 0             | 0             | 0             | 0             | 0             | 8             | 141           |
|               | 158           | 0             | 0             | 0             | 0             | 0             | 8             | 151           |
|               | 138           | 0             | 0             | 0             | 0             | 0             | 8             | 148           |
|               | 120           | 0             | 0             | 0             | 0             | 0             | 8             | 147           |
|               | 108           | 0             | 0             | 0             | 0             | 0             | 8             | 127.6         |
|               |               |               |               |               |               |               |               | 119.3         |
| DSP2          |               |               |               |               |               |               |               |               |
|               | RE1           | RE2           | RE3           | RF            | R             | RSP           | PE            | Total         |
|               | 103           | 15            | 0             | 2.4           | 0.6           | 8             | 0             | 129           |
|               | 93            | 27            | 0             | 2.4           | 0.6           | 8             | 10            | 141           |
|               | 117           | 20            | 0             | 2.4           | 0.6           | 8             | 0             | 148           |
|               | 114           | 37            | 0             | 1.6           | 0.4           | 8             | 0             | 164           |
|               | 111           | 15            | 0             | 0.8           | 0.2           | 8             | 0             | 147           |
|               | 70            | 0             | 0             | 0             | 1             | 8             | 0             | 89            |
|               | 130           | 0             | 0             | 0             | 0             | 8             | 0             | 145.5         |
|               | 68            | 0             | 0             | 0             | 0             | 7.5           | 5             | 73            |
he did not use RE₂ means in the mesocycle at all. The percentage share of RE₁ resources in both mesocycles accounted for 92% and 77%, respectively. A minimal share in both DSPs was observed for such means as RE₃ (in DSP2, it does not occur), running force or rhythm.

Comparing the volumes of the main training agent (RE₁) in individual microcycles of the analysed DSPs (Fig. 2), it was found that their distribution in individual microcycles is slightly in favour of the first period. It should be noted that mainly the second-to-last microcycle – DSP2 - a larger volume of this training agent was used. The volume range in DSP1 for individual microcycles was from 113 to 158 km, and in DSP2, from 70 to 130 km.

In the case of DSP2, the competitor supplemented the volume of RE₁ in the first five microcycles with the RE₂ training agent, which was not used in the case of DSP2 (Tab. 1).

In Fig. 3, the distribution in individual microcycles of the PE training agent is presented. As it results from the demonstrated data, in the case of the first preparation for the marathon, the competitor used from 7 to 16 km PE, mainly in the first 5 microcycles (for the last 10 km). In the case of the second preparation for the marathon, he used PE mainly in the last 5 microcycles prior to the start.
Figure 3. Characteristics of PE for selected microcycles of H.S.’s tested DSPs

Table 2. Characteristics of training loads regarding the last, pre-start microcycles for H.S. in the tested DSPs (1 and 2)

<table>
<thead>
<tr>
<th></th>
<th>DSP1</th>
<th>DSP2</th>
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<tbody>
<tr>
<td><strong>Realisation of the pre-start mesocycle</strong></td>
<td></td>
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<tr>
<td>Day 6 - RE, 10 km</td>
<td></td>
<td>Day 6 - RE, 14 km</td>
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<tr>
<td>Day 5 - RE, 6 km</td>
<td></td>
<td>Day 5 - RE, 6 km + PE 4km</td>
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<tr>
<td>Day 4 - free</td>
<td></td>
<td>Day 4 - free</td>
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<tr>
<td>Day 3 - RE, 14 km</td>
<td></td>
<td>Day 3 - RE, 14 km</td>
</tr>
<tr>
<td>Day 2 - RE, 9 km</td>
<td></td>
<td>Day 2 - RE, 7 km + PE 1km</td>
</tr>
<tr>
<td>Day 1 – warm-up</td>
<td></td>
<td>Day 1 – warm-up</td>
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<tr>
<td>Marathon start - Mungyeong 2:17:43 h. (Vm.)</td>
<td>Marathon start - Biwa Lake - DNF</td>
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</table>
Summary and conclusions

Nowadays, without scientific support for an athlete’s training process, a high sports level cannot be achieved [5]. A comprehensive approach to training becomes important. The problem of optimal application of training loads is one of the most important issues to be considered. The selection of training means and their volume should be adjusted to the sports level of the athlete. In scientific research, the relationship between the training stimulus used and the reaction of the athlete’s body to it is often sought after by researchers. Optimisation of these relationships allows changes to be made in the athlete’s training process with the minimisation of training errors [4,5,7].

In endurance competitions, the most important parameters that decide about the sports level are mainly aerobic fitness, threshold speed and running economy [12,13,14,15,16]. It can therefore be concluded that the most important task in preparing for this competition is the optimal use of available (previously trained) energy sources [17].

The marathon run is a competition that requires individual, special preparation for each marathon runner [18]. The training process should be a consciously organised activity leading to the set goal. Putting together the right training plan is the best way to achieve the highest disposition during the main competition.

It is widely believed that the volume of training in a marathon determines the duration of sports form, while the level depends on its intensity [9].

The effectiveness of training is determined by the ability of the athlete and coach to organise and plan the training process, from the training unit to the long-term plan [19]. In preparation of the first of the analysed DSPs, a greater number of training units (82) was found compared to the second (70). In literature on the subject [1], the frequency of training was found for such a period to be over 100 units, which on average, totals 10-13 in a weekly microcycle. This fact provokes reflection that the volume of the athlete’s units realised in the examined periods is small compared to those proposed by Prus [20], which specifies the number of training units in the week from 15 to 20, which gives from 120 to 160 in 8 weeks of training units.

A characteristic feature of the training of the studied athlete is the small variety of training means used. As stated, RE, was the main training agent, which ranged from 77% to 92% of the volume (DSP1). In the work by Maciantowicz et al. [21], the average percentage share of this training means in a year, referred to as “measures that shape general endurance” (including RE, and RE_e), was implemented at the level of 89%. With reference to the authors’ research, the above value was comparable to DSP2. Comparing the training plans of other, high-performance marathon runners, an interesting correlation can be demonstrated. For example, in the German marathon runner Waldemar Cierpiński - two-time gold medallist of the Olympic Games in marathon running - RE, was at the level of 34-36% of the total work.

In the case of the authors’ research, the RE_e agent was used only in the second of the analysed periods and accounted for less than 10% of the volume, which in relation to the German marathon runner mentioned above (18% to 21% of the total volume), was lower. The average number of kilometres in the weekly microcycle for DSP1 and DSP2 was 137 and 130 km, respectively, which is a small volume compared to competitors with the highest sports level, also in Poland. In the research by Maciantowicz et al. [21], in individual weekly microcycles, the authors propose a volume of 160 to 130 in the week in which the marathon starts. Also, the postulated volume in preparation for the marathon during the starting period for the H.S. ranges from 170 km to 265 km, with an average of 218 km, which is the value indicated by Ferreira and Rolim [22].

The world’s leading marathon runners had a much larger training volume than the tested subject. The best English marathon runner - Ron Hill (life record 2:09:28) ran 160-170 km per week, while for Steve Jones (2:08:05), the 1984 world record holder, this value ranges from 135 to 180 km [1], totalling approximately 1,400 km in 8 weeks.

Comprehensive selection of training means plays a key role in the training process of marathon runners. The running force used by marathon runners is aimed at increasing the strength of the leg muscles, without increasing their volume [1]. The number of RF kilometres in the training concept of preparation for DSP2 was three times higher than in the plans for the first DSP (3.4 km). However, one
should bear in mind the general development exercises that enhance and maintain an athlete’s motor potential while reducing the likelihood of injuries and contusions. According to the authors’ research, H.S. did not use the abovementioned measures in the analysed training.

In preparation for the marathon start - both in DSP1 and 2, a small amount of ‘farleks’ (a form of RSP) were used. The greater RSP volume is characterised by the training plan of the second DSP, in which the competitor ran 48 km. In the case of the first volume of this training means, it was twice as small and amounted to 23 km.

In the training of the tested marathon runner, there is no particular difference in the number of kilometres of pace endurance (PE). An interesting relationship can be seen in the last week of the DSP mesocycle, for which the PE values were identical and amounted to 4 km. It is worth noting that the final pace of the competitor before the marathon is carried out at the starting speed and was not more than 4 km. The development of the sports level in endurance runs can only occur through the intensification of training. The above-mentioned increase in volume has reached the limit. According to Maciantowicz et al. [21], increasing it may not increase the sports level and improvement may occur through the increase of special endurance.

The ultimate goal of the training plan is to achieve the best results at a competition [4]. There are many strategies to reduce pre-competition burden, which were also used in cooperation with the marathon runner in question. In both training plans, there was a significant reduction in the volume of training means. The competitor used similar preparation in the week before the start in both types of preparation for the marathon. One should pay attention only to the fact that in DSP1, the start in the competition took place on Friday and in the second case, on Sunday. However, after taking the above fact into account, the last 7 days before the start were the same in both cases (because the amount of the used PE training agent is not significant).

Despite similar preparation for the first and second marathons, the competitor did not complete the second one. Based on the available data, it cannot be determined what was the reason for abandoning the race route. It is known that the result in sport is affected not only by the load being carried out, but also by many other factors [7]. Also, it should be noted that the analysis was conducted 8 weeks before the start, and from this perspective, the loads and their nature were considered in the preparation of the athlete.

Based on the analysis of the presented data, the following conclusions can be formulated:

1. In the two presented DSPs before the start in the marathon, the competitor H.S. implemented a similar volume of running resources.
2. Only slight differences in training means occurred in the case of RE and PE.
3. Before the start in each of the two marathons, the competitor H.S. used similar training forms in the final week of preparation.
4. By comparing training loads and other world-class marathon runners, in comparison to them, the athlete tested in this study carried out a smaller volume and a variety of training means.

References:


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