



RESEARCH ARTICLE

## Investigation of General Preparation Period in Turkish Elite Triathletes

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### Abstract

Triathlon is an endurance-based sport, and performance success is strongly impacted by the training done throughout the general preparation phase. The aim of this study was to examine the duration, frequency, and volume of the general preparation phase training block in elite male triathletes. The 5-week training loads of 11 elite male triathletes (Height: 179 cm  $\pm$  2.82, Weight: 76  $\pm$  10.77 kg) in the general training period were examined. The weekly averages of endurance-based long-distance swimming training sessions were found to be (1.9 sessions, 204.5 minutes, and 5.4 kilometers), the weekly averages of endurance-based long-distance biking training sessions were found to be (1.5 sessions, 316.4 minutes, and 160 kilometers), the weekly averages of endurance-based long-distance running training sessions were found to be (1.5 sessions, 89.1 minutes, and 44.8 kilometers). These training sessions were identified as the most commonly performed exercises by coaches during the general preparation phase. The training sessions that are most frequently performed are followed by sprint swimming workouts in terms of duration and sprint biking workouts in terms of volume. When disciplines analyzed the durations of weekly training sessions, it was found that swimming accounted for approximately 360 minutes (Long: 204.5 minutes, Sprint: 128.2 minutes, Other: 27.27 minutes), biking accounted for approximately 460 minutes (Long: 316.4 minutes, Hill: 125.5 minutes, Sprint: 19 minutes), and running accounted for approximately 310 minutes (Long: 89.1 minutes, Hill: 62.1 minutes, Sprint: 61.3 minutes, Other: 98.1 minutes).

### Keywords

Triathlon, Performance, Training, Periodization

## INTRODUCTION

Triathlon is a type of endurance sport that includes three consecutive non-interval sports; swimming, biking and running over various durations and formats (Ambrosini et al., 2022; Bentley et al., 2002). The research data generally agree that running economy, anaerobic threshold, and maximum oxygen uptake are the primary physiological factors that affect performance in this type of mainly aerobic sporting event (Millet et al., 2011; Puccinelli et al., 2020).

Amateur triathletes train for roughly 13 hours per week (Esteve-Lanao et al., 2017), whereas elite triathletes typically train for over 20 hours per week

(Vleck et al., 2014). The general preparation period (GPP) is an essential part of the training cycle for elite athletes. Typically, the GPP focuses on strengthening the athlete's aerobic base, enhancing general fitness, and correcting any deficiencies or imbalances in their physical profile. During the GPP, triathletes aim to enhance their aerobic capacity, muscular endurance, strength, and overall physical conditioning to optimize performance in all three disciplines of the sport.

Elite triathletes follow rigorous training strategies based on their specific needs and goals. These strategies include a combination of endurance, strength and speed training in swimming, biking and running disciplines. To maximize their performance, triathletes prioritize

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consistent and progressive training that develops their aerobic and anaerobic capacity while minimizing the risk of injury. They also focus on nutrition and recovery to ensure optimal physical and mental health. Finally, triathletes also use strategies to develop mental toughness and maintain focus during long and challenging races. Overall, elite triathlete training strategies require a high level of dedication, discipline and endurance to achieve success in one of the most demanding endurance sports (Erdoğan, 2022).

This study aimed to investigate the general preparation period training block in triathlon athletes in terms of duration, frequency and volume. We hypothesized that triathletes have more volume on biking and running and more training frequency on swimming.

## MATERIALS AND METHODS

### Participants

Data (training parameters) from the 11 elite triathletes (Age:  $23.4 \pm 1.3$ , Height:  $179 \text{ cm} \pm 2.82$ , Weight:  $76 \pm 10.77 \text{ kg}$ , BMI:  $23.7 \pm 2.6$ ) were recorded weekly. All triathletes were selected from the top 5 ranked athletes in the Turkish Championships. Ethical approval for the study was obtained from the University's ethics committee (approval number: E-34183927-000-00000903391). Participants provided informed consent and the research strictly adhered to the ethical principles of the Declaration of Helsinki.

### Research Model

In this study, we used quantitative research models to investigate elite triathletes' training parameters (duration, distance, frequency). In the general preparation phase, data was collected (interviews) from the triathlete coaches and recorded weekly as training duration (minutes), frequency (AU) and distance (km). Quantitative data were presented in tables and figures.

### Data Collection Techniques

The training records of 11 elite male triathletes in the Turkish Triathlon Federation classification were followed for 5 weeks. The coaches sent these data using the athletes' wearable

watch devices. Athletes worked with different coaches in different places. To ensure homogeneity, we sent the coaches the same type of chart to keep records and asked them to collect these records at the end of the training. The training strategies were tried to be revealed by classifying the training performed in this training block, which is considered a general preparation phase and extremely important for triathletes. Except for the younger generation, triathletes are trained by the same trainers. However, a triathlon coach should be as knowledgeable as a middle-distance athletics coach, middle-distance swimming coach and road cycling coach. For this purpose, coaches follow the coach education programs of three different federations. Since triathlon is a developing sport in our country, the fact that there are not many licensed athletes in the elite category limits the study. The training sessions will be recorded firstly in terms of the number of training sessions, secondly in duration and finally, distance covered. Triathletes make use of athlete wearable technologies to track their training. These wearable technologies record training time and training distances. Coaches used this data to answer our questions. Although the wearable technologies differ in brand and model, this did not affect our study of time and distance information.

### Statistical Analysis

All data were presented as mean and standard deviation with 95% Confidence interval. Analysis of data was performed using the GraphPad Prism 9 software.

## RESULTS

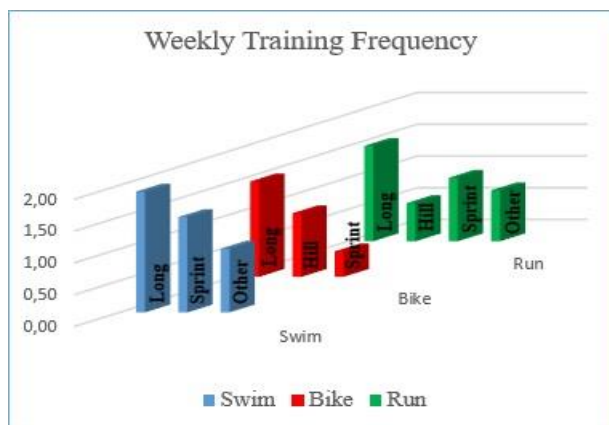
Our results revealed that triathletes focus on all three events similarly in training frequency in the general preparation phase but slightly higher training frequency for swimming with an average of 1.9 sessions (Table 1, Figure 1).

In terms of duration, triathletes have long swimming, long biking and long running with an average duration of 204 minutes, 316 minutes and 89 minutes respectively. Triathletes have more training duration for biking and swimming (Table 2, Figure 2).

**Table 1.** Weekly training frequency in the general preparation phase

Exercise	Frequency (AU)			
	Long	Sprint	Other	
Swim	1.9±0.7 (1.4-2.3)	1.5±0.5 (1.1-1.8)	1±0.9 (0.4-1.7)	
	Long	Hill	Sprint	
Bike	1.5±0.5 (1.1-1.8)	1±0 (1-1)	0.4±0.5 (0.1-0.8)	
	Long	Hill	Sprint	Other (i.e. easy jogging)
Run	1.5±0.5 (1.1-1.8)	0.6±0.5 (0.2-0.9)	1±0 (1-1)	0.8±0.4 (0.5-1)

Data are presented mean and sd with 95% Confidence Interval; AU: Arbitrary Units



**Figure 1.** Weekly training frequency in the general preparation phase

**Figure 2.** Weekly training duration in the general preparation phase

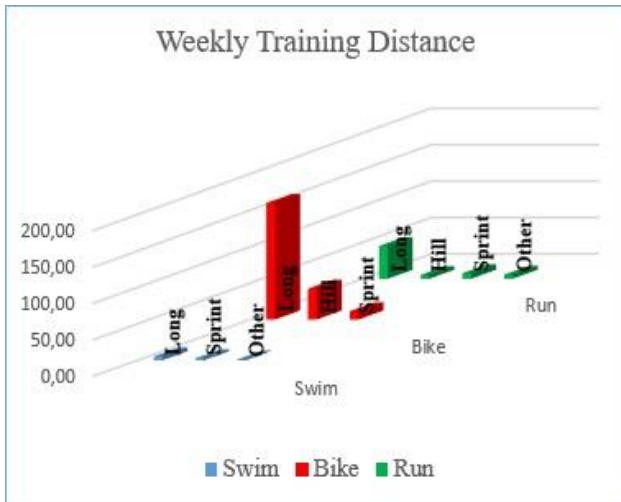
**Table 2.** Weekly training duration in the general preparation phase

Exercise	Duration (minutes)			
	Long	Sprint	Other	
Swim	204.5±111 (130-279.1)	128.2±67.2 (83-173.2)	27.27±31.3 (6.2-48.3)	
	Long	Hill	Sprint	
Bike	316.4±100.7 (248.7-384)	125.5±49.8 (91.9-159)	19±24.2 (2.7-35.4)	
	Long	Hill	Sprint	Other (i.e. easy jogging)
Run	89.09±75.03 (38.6-139.5)	62.1±90.6 (1.2-123.1)	61.3±32.9 (39.2-83.5)	98.1±41.9 (70-126.3)

As for the training distance covered, the same trend was observed. Triathletes have an average distance covered (km) for long swimming long biking and long running with 5.4 km, 160 km and 44.8 km respectively (Table 3, Figure 3).

**Table 3.** Weekly training distance covered in the general preparation phase

Exercise	Distance (km)			
	Long	Sprint	Other	
Swim	5.4±3.9 (2.8-8)	2.7±2.4 (1.05-4.4)	1±1.3 (0.09-1.9)	
	Long	Hill	Sprint	
Bike	160±63.87 (117.1-202.9)	42.3±28.3 (23.3-61.3)	11.3±15.6 (0.83-21.8)	
	Long	Hill	Sprint	Other (i.e. easy jogging)
Run	44.8±14.6 (34.9-54.6)	5.1±5 (1.7-8.4)	7.5±2.5 (5.7-9.1)	5.5±3.8 (2.9-8.1)



**Figure 3.** Weekly training distances in the general preparation phase

## DISCUSSION

The purpose of this study was to investigate the training parameters among Turkish elite triathletes in the general preparation phase. The results of this study showed that in terms of distance (km) triathletes cover more distance in biking whereas less distance in swimming. Secondly, in terms of duration, they have more training duration in biking and swimming. Furthermore, they have more training sessions in swimming. Our findings show that the weekly training load is mostly oriented towards long-distance endurance sessions, with the highest training volumes observed in biking (316.4 minutes, 160 km) and swimming (204.5 minutes, 5.4 km). In addition to endurance sessions, triathletes have included training such as sprint swimming, hill biking and sprint running workouts.

Similar to our research, the authors examined the training habits and injury occurrences among British triathletes during the competitive season of 1990. Participants reported an average weekly training distance of 100.2 km for cycling, 23.4 km for running and 4.2 km for swimming with an average training time of 7 hours per week across 7.9 sessions. We may conclude that triathletes perform more volume in cycling training sessions and less volume is performed in swimming sessions (Korkia et al., 1994).

Triathlon is an endurance sport and includes swimming, biking, and running events. Performing these three branches on top of each other requires the use of different energy sources and meticulous planning of training for performance. When

planning training, different periodization strategies are used to achieve the desired performance in competitions. The distribution between intensity and volume in macrocycles and mesocycles occurs in different training structures (Arroyo 2013; Uusitalo 1998). These training periodization models are traditionally based on high-volume and low-intensity training in the first phase of macrocycles, followed by a gradual increase in training intensity and a decrease in training volume (Bompa, Matveev 1981).

Triathletes' competition season usually starts in the spring and lasts until the end of summer. Before the competition season, triathletes have a preparation period, often referred to as the general preparation period, which is an important period for triathletes to prepare for the competition season. During this period, triathletes need to direct their training program and lifestyle in the right way to help them perform better on their race rides. This period is often called general preparation by coaches and physiologists worldwide and in various sports (Friel, 2013).

During the general preparation period, triathletes also strive to maintain a healthy lifestyle, including proper nutrition, sleep and rest, as well as sticking to their training program. This helps them to perform their race tasks at their best. The purpose of this period is for triathletes to train to improve their overall fitness, develop their strength and prepare for the racing season. This period usually covers 12-16 weeks before the end of winter and the start of the racing season. Training volume has a special place in training planning for triathletes. The distance to be covered by the triathlete, the number of training sessions and the duration of the training must be included in the training plan (Erdoğan, 2022).

In terms of specific training methods, endurance athletes in the general preparation phase should focus on building a base level of aerobic conditioning through low to moderate-intensity endurance training. This can include activities such as long-slow distance (LSD) running, biking and swimming which is considered an endurance sport, like other endurance sports, has a "dose-response" relationship in its training. Stimuli during training periods are related to the intensity, frequency and volume of training (Borresen & Lambert, 2009).

The general preparation period consists mainly of training in Zones 1 and 2. A study in Elite and Subelite triathletes showed that decreasing the



duration of training in Zone 1 (71%) and increasing the total duration of training in Zone 2 (21%) and Zone 3 (8%) caused a decrease in performance (Esteve-Lanao et al., 2005; Esteve-Lanao et al. 2007). In many descriptive studies, it has been reported that endurance athletes at the international and national level perform 10-13 units of training per week. Of these workouts, 80% of these workouts are known as low intensity and consist of workouts below 2 mmol/L lactate level (Seiler, 2010).

High-intensity planned training volume can increase injury and illness rates, but recent advances in this area can minimize this risk while maximizing performance. Strength training should be increased gradually, especially in biking. This is a common feature not only of the general preparation training period but of all periods. In February-May, when the competition date is approaching, strength training is more focused on full-exertion explosive efforts (Wallmann 2001).

There were several limitations to this study. The sample was drawn from Turkish national triathletes therefore the sample size is small and the results may not be generalized to the other nations' triathletes. Future studies should collect data with a large sample size and also for long-term training programs. Moreover, it would be beneficial to collect data on the injury patterns of triathletes so that coaches can be informed about the injury cases among triathletes.

In the general preparation period, it was determined that triathletes performed more long-distance swimming, long-distance biking, and long-distance running training in terms of the number of weekly training sessions and distance, as well as the time allocated, compared to other training sessions. In this period, elements such as the number of weekly training sessions, distance, and training duration, which are presented as training markers, should be well planned by coaches. However, endurance sports, such as triathlon, require more than just training time, number or mileage. With the combination of the markers mentioned in the study and the athlete's physical, social and mental state, the coach should manage the training of the general preparation period. We believe that the awareness of coaches will be increased with this study. The results of the study will verbally explained to the coaches in various workshops and they will be informed about training volume and intensity.

## Conflict of Interest

No potential conflict of interest relevant to this article was reported.

## Author Contributions

Study Design: O.K., M.E., N.P., N.E.A. Data Collection: M.E., N.P. Statistical Analysis: O.K., N.P., Data Interpretation: O.K., M.E., N.P., N.E.A., Manuscript Preparation: O.K., M.E., N.P., N.E.A., Literature Search: O.K., M.E., N.P., N.E.A. All authors have read and agreed to the published version of the manuscript.

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