



**Journal of Physical Health and Sports Medicine**

Review Article

Open Access

**Training adaptations during Ramadan fasting: The FITT principle, progressive overload and recovery**

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**Received Date:** Dec 10, 2018 / **Accepted Date:** Dec 26, 2018 / **Published Date:** Dec 28, 2018

**Abstract:** During Ramadan, it is mandatory for all healthy and sane Muslims that have reached puberty to abstain from food, drink and sexual intercourse throughout the daylight hours. Changes in diet and hydration have adverse effects on the athletes' training performance, especially for elite athletes. Therefore, coaches and sport scientists have developed strategies to counteract the effect of Ramadan fasting by applying the three training principles, namely i) FITT principle (Frequency, Intensity, Time and Type), ii) progressive overload and iii) recovery. Studies have shown that Ramadan fasting causes detrimental effects on several physiological outcomes such as anaerobic power, maximal aerobic power, muscular strength and endurance. In addition, reduction in the training load before or during Ramadan will result in poorer physical performances among the well-trained athletes. Adaption in the training principles will allow athletes to maintain training performance while fasting and to achieve their training goals. This is an original paper that aimed to elaborate on the training principles and how its effect on maintaining training performance throughout the month of Ramadan.

**Keywords:** Training principle; Adaption; Ramadan; Fasting; FITT

**Cite this article as:** Hussein Rizal, Mawar Siti Hajar, Garry Kuan. 2018. Training adaptations during Ramadan fasting: The FITT principle, progressive overload and recovery. J Phy Hea Spt Med. 1: 23-29.

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### Introduction

In Islam religion, Ramadan fasting is mandatory for all healthy and sane Muslims that have reached puberty. It is compulsory for Muslims except for those who are with medical conditions [1]. During this month, Muslims abstain from eating, drinking and having sexual intercourse from dawn until sunset. Therefore, Muslims are required to change their meal times to early morning known as “suhoor”, and after sunset known as “iftar”. These changes to meal time might decrease the quality of sleep [2], and this could lead to significant implications for physical exercise and performance [3].

Besides, long periods of food and fluid deprivation often leads to dehydration and low carbohydrate reserves that could affect the individual’s sporting performance [4]. For example, Zerguini et al. [5], found that Ramadan fasting has detrimental effects on speed, agility, dribbling speed and endurance among the football players. In addition, Ramadan fasting has also shown to reduce muscular strength and endurance [6], high-intensity exercise performance [7], anaerobic power, [8-11], and maximal aerobic power [12]. Therefore, coaches and sport scientists have developed strategies to counteract the effect of Ramadan fasting by adjusting training time and overall training intensity.

### Training adaptations

For athletes to train at the highest-level during Ramadan, Chaouachi et al. [13], stated that athletes are unlikely to suffer any large detrimental effect in athletic performance during fasting if they maintain their total energy level via having adequate macronutrient intake; adequate fluid intake; sufficient sleep and adapting to the training load whilst fasting. Training adaptation is a concept that is often considered by the coaches to plan and execute

a training program in which the FITT principles (Frequency, Intensity, Time and Type) and progressive overload principles are commonly used to adjust training regimes to achieve a specific goal(s) [14,15]. In the case of training during Ramadan fasting, the primary goal is maintenance rather than progression so that athletes can maintain their expectations and achieve more realistic goals.

A study showed that nearly 70% of 55 professional Algerian football players felt that their training quality was adversely impacted by Ramadan fasting, although it was unclear which aspects of the players training quality were affected [5]. In support of this finding, a large-scale investigative survey (n=900) was conducted among the Junior and Senior level national athletes. The study found that thirty percent of those questioned considered that their training sessions were unfavourably affected by Ramadan fasting [16,17]. This section of surveyed athletes stated further that they felt that all aspects of training variables (i.e., frequency, duration and intensity) were adversely impacted [17]. Therefore, adjusting the FITT principle may reduce the perceived negativity of Ramadan fasting on training as well as physically equipping the athletes with training methodology that can be maintained throughout the fasting month.

### *FITT principle*

The FITT principle is divided into four components based on its acronym; frequency, intensity, time and type [18]. Frequency is the number of training sessions conducted per week. Intensity refers to the amount of effort or work placed in each training session and is often measured in percentage of maximal heart rate and perceived exertion. Time is the duration of each training session. While the type is the type of exercise that will be done during the training session. A key point in implementing a fitness program is to set



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realistic goals [14]. The type of exercise may be determined by the specific goal set by the coach (i.e., cardiovascular endurance, strength training, agility or balance and coordination). During Ramadan fasting, the frequency, intensity and duration must be reduced so that athletes can cope with the training regime. Due to the lack of carbohydrate reserves and hydration during fasting, training performance becomes subpar which demotivates the athletes as they are not able to achieve their pre-fasting training goals. It is advisable for athletes not to progress their exercise routine (increase in weights, sets, repetitions, speed or distance) during Ramadan, rather, maintain their progress in the previous month [19]. Placing realistic FITT goals may maintain adherence and motivation continuously throughout this month. Based on this principle, training loads can be modified to sustain energy levels and further utilise it to achieve an effective training session [14].

### *Progressive overload*

Besides the FITT principle, progressive overload on submaximal exercises have been shown to improve endurance performance during Ramadan fasting [20]. The progressive overload principle is simply the progression of

training load over time. It is well known to improve training outcomes. Thus, athletes must continuously work harder as their bodies adjust to the existing training due to metabolic and physical adaptations to the body. The progressive overload training principle aims to stimulate continuing adaptations and consists of progressively increasing the training loads in time, by modifying mainly the training volume and intensity [21]. However, the reduction in the training load before and during Ramadan resulted in poorer physical performances among well-trained athletes [13].

To reduce losses in performance, an athlete's training load should be reset to the bare minimum during the first week of Ramadan and then progressively increased throughout the month until the training load matches the athlete's pre-Ramadan period in the last week of Ramadan (Table 1). Besides, the most significant perturbations that are due to Ramadan fasting have been reported to occur in the first week of Ramadan [13]. Therefore at least two weeks before the start of Ramadan, the appropriate coping strategy should be gradually introduced. Both the FITT and progressive overload principles meld together to form an effective training regime throughout the Ramadan fasting month.

**Table 1:** Example of FITT and progressive overload principles during Ramadan fasting.

Period of fasting	Training load (volume)	Intensity	Changes made
Pre-Ramadan	2-3 hours, 5x/week	60-90% maximal heart rate	No changes
1 <sup>st</sup> week	1-2 hours, 3x/week	60-70% maximal heart rate	Bare minimum (initial value)
2 <sup>nd</sup> week	1-2 hours, 3x/week	60-80% maximal heart rate	Increase 10% in intensity
3 <sup>rd</sup> week	2-3 hours, 3x/week	60-90% maximal heart rate	Increase duration and 10-20% in intensity
4 <sup>th</sup> week	2-3 hours, 5x/week	60-90% maximal heart rate	Increase frequency of training per week



### Recovery

Since Muslims fast throughout the daytime, coaches tend to set their training time two to three hours after breaking fast while reducing the training volume [22]. Alternatively, athletes wake up two to three hours before suhoor to train and then fast throughout the day. Early morning training time is easier for more individualised sports as it requires more commitment from the athlete. Whereas, night time training is more suited for team sports as more players can adhere to the training schedule. Besides, lower intensity training focusing on technical and light workout before breaking fast is a common theme among Muslims as they can quickly rehydrate and replenish their glycogen stores after a training

session [23]. Studies have shown that afternoon training during Ramadan might be more effective than morning or night training to improve aerobic capacity among trained endurance athletes [22].

Additionally, a study investigating two different training time frames during Ramadan fasting for sports (volleyball, karate, taekwondo and football) have concluded that daytime or night training did not inversely affect the agility and power performances of elite athletes during Ramadan fasting [24]. Therefore, technical training focusing on technique and skill building is emphasised during daylight hours to effectively spread out training sessions and allow more time for recovery (Table 2,3).

**Table 2:** Example of training program during early morning.

Time	Activity	Intensity	Resting Interval
3.00am - 5.00am	Training session (Main performance)	60-90% maximal heart rate	2:1 to 1:1
5.00am - 5.45am	Suhoor (Heavy breakfast)	-	-
6.00am - 5.00pm	Daily activity (Fasting)	-	-
5.00pm - 7.00pm	Training session (Skill building)	50-70% maximal heart rate	1:1 to 1:2
7.00pm - 8.00pm	Rest & iftar (Heavy dinner)	-	-
8.00pm - 3.00am	Recovery period (Sleep & rest)	-	-

Considering this knowledge, many coaches plan a comprehensive training program for their athletes to adapt to the challenges faced during this month. Current studies support findings that individuals who maintain their total energy, macronutrient intake, training load, body

composition, sleep and quality length are unlikely to suffer any substantial detrimental effect in athletic performance during Ramadan fasting [13]. Essentially, training schedules are strategised that maximise athletes' recovery.



**Table 3:** Example of training program during night time.

Time	Activity	Intensity	Resting Interval
5.00am - 5.45am	Suhoor (Heavy breakfast)	-	-
5.45am - 5.00pm	Daily activity (Fasting)	-	-
5.00pm - 7.00pm	Training session (Skill building)	50-70% maximal heart rate	1:1 to 1:2
7.00pm - 8.00pm	Rest & iftar (Light dinner)	-	-
8.00pm - 10.00pm	Training session (Main performance)	60-90% maximal heart rate	2:1 to 1:1
10.00 - 5.00am	Recovery period (Sleep & rest)	-	-

## Conclusion

In short, FITT, progressive overload and recovery principles play an integral part in maximising the training performance and reducing the detrimental effects during Ramadan fasting. Other principles including specificity, individuality and reversibility are also important when considering creating a training regime, even more so when athletes are required to cope and adapt to starvation and inadequate hydration. Also, coping strategies such as maintaining carbohydrate load during suhoor and iftar, maintaining hydration as well as acquiring enough quality sleep can further improve an athletes' ability to train and achieve their training goals continuously. Future studies may incorporate a holistic approach regarding all the training principles available to obtain a more comprehensive structure for implementing a training program during the fasting month of Ramadan.

## Acknowledgment

The authors gratefully acknowledge the financial support from Universiti Sains

Malaysia (USM) for awarding USM Fellowship Scheme to Rizal H, and USM Graduate Assistance to Hajar MS.

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