# Guru Performance Position Stand
# #1 - Fasted Training & *Body Composition*

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## OVERVIEW



## (1) INTRODUCTION

Over the years there has been a substantial research effort to establish effective and efficient methods of promoting body fat loss; something that is desired by elite athletes and 'average Joe' at some point in time. Exercise is a mainstay strategy used by many to aid with the loss of body fat, with some arguing that the timing of nutrition around exercise could also be important. Specifically, it has been proposed that performing exercise sessions in the fasted as opposed to non-fasted (fed) state could help to accelerate the loss of body fat.

The efficacy of fasted exercise for this purpose has been a hot topic of debate across both the scientific literature and general public (particularly across popular social media!), which has led to a certain degree of confusion on the matter among many. The purpose of this article is to help provide some clarity. Specifically, we will aim to: (i) provide an overview of current research that has investigated the potency of fasted exercise on body fat loss, (ii) discuss the potential limitations to fasted exercise and suggest practical strategies to help offset these, (iii) offer our thoughts on the practicality of using fasted exercise as a tool to improve body composition in the 'real world' setting with 'real world' people, and (iv) propose some future

research directions.

Before we get into it, we feel it's important to acknowledge that it is beyond the scope of this article to provide an in depth commentary on *all* of the available literature in this area. Nor are we able to cover each and every practical consideration relating to the use of fasted exercise. What we aim to do is explore some of the most pertinent aspects of this training methodology using a completely unbiased approach, and we encourage readers to get in touch with us directly should they have any questions, or would like to share with us their own thoughts and / or experiences.

Finally, it is also worth noting that this article delves into the efficacy of fasted training from a body composition (physique) standpoint, and it should be acknowledged that fasted exercise could be useful for reasons other than this, such as for improving metabolic health and / or exercise performance. But don't worry; the latter will be the focus of our second technical article – **coming your way soon**!

# (2) WHAT IS FASTED EXERCISE AND HOW IS IT PERFORMED?

Fasted exercise (commonly referred to as 'training low') refers to training with reduced energy availability (typically achieved through carbohydrate restriction), usually at a low to moderate intensity. The classic and most popular way to train fasted is to exercise in the morning before breakfast (after an **'overnight fast'**; ~8-12 hours of no food or fluid [except water]). However, there are other ways in which fasted exercise can be executed:

**Training twice a day:** This involves performing two workouts per day. The first is performed having consumed some carbohydrate. This is then followed by low or preferably no carbohydrate intake before the second workout.

**Long training without carbohydrate intake:** Workouts of >90 minutes in duration are performed without any carbohydrate intake during exercise. This is due to the fact that after 90 minutes of exercise, carbohydrate (glycogen) stores in the body become mostly depleted, increasing the reliance of fat as an energy source.

**Sleep low:** This method involves training to deplete carbohydrate stores before sleep and purposely restricting carbohydrate intake until *after* the next workout on the following morning. For example, Impey et al. (2016) and Taylor et al. (2013) utilised a 2-hour aerobic exercise protocol to deplete glycogen before participants slept low and trained low the subsequent day.

*"There are several ways you can train low – the most popular being to perform exercise before eating breakfast after an overnight fast"*

# (3) IS FASTED EXERCISE MORE POTENT THAN NON-FASTED EXERCISE AT REDUCING BODY FAT?

The majority of studies demonstrate that a bout of aerobic exercise performed in the fasted as compared with non-fasted state increases the reliance on fat and subsequently reduces the reliance on carbohydrate as fuel during exercise, with several publications showing that fasted exercise oxidises (burns) ~20-30% more fat (for review see Viera et al. 2016). As such, it seems logical that one might consider implementing fasted training into their exercise regime should their aim be to reduce their level of body fat.

*Typically, fasted exercise increases the reliance on fat and subsequently reduces the reliance on carbohydrate as fuel during low-moderate intensity exercise"*

However, evaluating the amount of fat used during an exercise bout offers only a snapshot of the physiological response and often fails to provide the complete picture i.e., what happens to fat utilisation over the course of a day, which is far more relevant from a body composition perspective. Indeed, for quite some time it has been suggested that the timing of nutrition around exercise has little influence on the total amount of fat used over a day. This is because research has typically shown that fasted exercise burns more fat during exercise, but fat burning tends to be higher in the 2-3 hours following non-fasted exercise; ultimately meaning that the two methods impose the same effect on fat utilisation over time (at least over a 3-6-hour measurement period).

To properly assess the influence of the timing of nutrition around exercise on daily body fat balance (which is the 'master regulator' underpinning changes in fat mass) requires the measurement of accumulated fat oxidation over 24-h; something that research has only just began to adequately explore. A team of scientists in Japan recently performed a series of well-controlled studies, each of which investigated the influence of fasted versus non-fasted exercise on daily fat utilisation using a whole room respiration chamber and indirect calorimetry (Shimada et al. 2013, Iwayama et al. 2015a, Iwayama et al. 2015b). Interestingly, these studies have consistently found that daily fat oxidation is increased ONLY when exercise is performed in the fasted but not fed-state; an effect that appears to be independent of energy balance.

*"Daily fat oxidation is increased only when it is performed in the fasted state; an effect that was independent of energy balance"*

In theory these findings imply that regular fasted exercise (performed over a period of weeks and months) could be a more 'efficient' means of using exercise to induce a negative fat balance and accelerate body fat loss, as compared with performing equivalent bouts of energy-matched exercise in the non-fasted state. To put this theory to the test requires a series of longitudinal studies of exercise training; comparing the effect of regular exercise performed in the fasted and non-fasted state on body composition. Surprisingly, to date only a few studies have looked into this - we have documented the main findings of these studies in the table below.

| ***No*** Superior Effect of Fasted Training on Body Composition ✗ | Superior Effect of Fasted Training on Body Composition ✔ |
|---|---|
| *Schoenfeld et al. 2014* | *Van Proeyen et al. 2010* |
| • Cohort = 20 healthy females<br>• Four weeks of volume-matched **fasted** versus **fed** aerobic exercise<br>• Training = 1 hour steady state aerobic exercise 3x per week.<br>• Both groups showed a significant loss of weight and fat mass.<br>• No significant between-group differences were noted in any outcome measure. | • Cohort = 28 healthy males<br>• 6 week training-diet intervention.<br>• Three groups = fat rich diet with (i) fed exercise (ii) fasted exercise (iii) no exercise (control).<br>• Two 60 min and two 90 min supervised training sessions per week. Mix of running (85% max HR) and cycling sessions (75% $VO_2$ max).<br>• Both fed and control groups gained weight (fat mass) whilst fasted group remained unchanged. Indicates an increase in exercise fat oxidation protects against fat gain during a period of energy (fat) surplus. |
| *Gillen et al. 2013* | *Marquet et al. 2016* |
| • Cohort = Sixteen overweight women<br>• Two groups = **fasted** or **fed**, performed 18 sessions of HIT (10× 60-s cycling efforts at 90% maximal heart rate, 60-s recovery) over 6 weeks.<br>• There was no significant difference between **fasted** and **fed** for any measured variable. Only exercise itself had a positive effect on measured variables. | • Three-week training-diet intervention.<br>• Two groups = sleep low (SL) or control (CON)<br>• Three blocks of diet-exercise manipulations: **1**) "train-high" interval training sessions in the evening with high-CHO availability, **2**) overnight CHO restriction ("sleeping-low"), and **3**) "train-low" sessions with low endogenous and exogenous CHO availability. Control group group followed the same training program but with high CHO availability throughout training sessions.<br>• SL **superior** for body fat loss (with no lean mass change) and exercise performance adaptations. |

To summarise the available literature, it appears that the jury is still out as to whether fasted exercise is more potent than non-fasted exercise at reducing body fat when it is performed regularly, over a period of weeks / months. This is mainly due to the fact that there are only a handful of studies that have directly compared the two conditions over an extended period; the findings of which are divergent. In theory, fasted exercise should be more potent, however a series of well-controlled longitudinal studies are needed in both trained and untrained populations before any definitive conclusions can be made. We greatly anticipate seeing such data, and hope that we will be able to re-write this article in the near future with more definitive conclusions!

*"In theory, fasted exercise should be more potent, however a series of well-controlled longitudinal studies are needed in both trained and untrained populations before any definitive conclusions can be made"*

# (4) WHERE DOES ENERGY BALANCE FIT IN?

We know that you're all thinking 'what about energy balance?' and you'd be right to wonder what role energy balance plays in all of this. So, we'll try and shed some light and tie everything together.

Firstly, it's important to remember that fat oxidation (burning) and fat loss are not synonymous. A reduction in body fat will ONLY happen in the presence of a negative fat balance, which occurs when more fat is oxidised (used) than is synthesised (created). A negative energy balance (burning more calories than you take in; see schematic below) is key to creating a negative fat balance, since lipid synthesis will be partially blocked when energy intake is less than energy expenditure. A significant reduction in body fat usually requires the presence of a negative fat balance over a sustained period of time (i.e., days, weeks, months) and so implementing strategies (i.e., diet and/or exercise) that promote a sustained negative fat balance is key to losing body fat. Whilst fasted exercise is not the holy grail of fat lass, it could help increase the efficiency of exercise and, importantly, daily fat oxidation which over-time could influence fat balance and accelerate the loss of body fat. As we said, further work is required to adequately test this theory.


# (5) WHAT ARE SOME OF THE POTENTIAL LIMITATIONS TO FASTED EXERCISE?

**Its influence on training intensity:** In a fasted state both liver and muscle glycogen are likely to be low, which in turn could lead to a reduced blood glucose level. These effects could make tough exercise sessions (i.e., those performed at a high exercise intensity) even more difficult. As such, it would be important to target fasted sessions at those that are performed at a low-moderate intensity i.e., 30-60 min jog / cycle / swim. Pre-training caffeine ingestion (moderate dose of 100-150 mg), protein, and/or carbohydrate mouth rinsing during exercise (Lane et al. 2013; Taylor et al. 2013; Impey et al. 2015) could be viable strategies to offset any potential decrements in training intensity a parallel with fasted exercise.

**Its influence on immune function:** Although we typically associate metabolic processes such as glycolysis, glutaminlysis, fat oxidation and protein degradation in the context of muscle metabolism and exercise, they are all important factors in the metabolism and synthesis of various immune system components. Importantly, if these metabolic processes are over used or stressed chronically, this may lead to immunosuppression.

Therefore, being in a prolonged energy deficit and/or repetitively training in a fasted state may result in a compromised immune function (Venkatraman et al. 2002). In this respect, to help prevent any decrements in immune function whilst training it would be important to perform some, but not all, training sessions fasted (mix it up!).

*"Repetitively training in the fasted state could compromise immune function. If you choose to exercise fasted, it would be important to perform some, but not all, training sessions in this state"*

**Its influence on muscle mass:** Another consideration is the effect that a negative energy balance and fasted exercise might have on maintaining muscle mass, which on top of its aesthetic appeal plays a crucial role in supporting overall health and wellness. In order to simply maintain muscle, our body must match protein degradation rates with that of protein synthesis. To achieve this one should consume protein and exercise, both of which stimulate the protein synthetic response and complement each other when combined. In an energy restricted state, the rate of muscle protein breakdown is higher and it is difficult to offset this effect unless adequate protein **AND** carbohydrates are fed (Impey et al. 2016). It is crucial that adequate protein is consumed frequently during the waking hours (~30g servings every 3-4 hours), particularly around the exercise bout in order to maintain muscle mass whilst positioned in an energy deficit; something that recent studies in weight making athletes provides an evidence base of support for (Wilson et al. 2015). Interestingly, recent research published in the journal Amino Acids (Impey et al. 2015) demonstrates that leucine-enriched protein feeding prior to and during exercise does not influence fat oxidation during subsequent exercise (that is, it does not take a person out of being in a 'fasted state'). Therefore, there could be some merit to feeding protein before and/or during fasted exercise, particularly if one is looking to avoid losing muscle mass (*protein feeding could also help offset pre-exercise hunger prangs). Indeed, practitioners who have taught on our ISSN Diploma Program have detailed their use of this approach with numerous elite level athletes, who employ fasted exercise to improve their body composition and/or exercise performance.

*"Feed with high quality protein regularly to stimulate the protein synthetic response, and reduce the potential for losses in muscle mass"*

# (6) PRACTICAL CONSIDERATIONS

So far we've touched upon what fasted training is, the efficacy of fasted training for fat loss and the potential limitations of this training method. However, we haven't covered arguably the most important aspect for consideration – **exercise adherence.** Through our own experiences working with a range of different people (mainly elite through recreational level athletes), we have found that peoples view of 'fasted exercise' is somewhat similar to that of Marmite. That is, they either love it or they hate it! As we mentioned earlier, fat balance is the master regulator underpinning changes in body fat, and if a significant reduction in body fat is sought after then a state of negative fat balance must be achieved over a sustained period of time. Exercise is a primary means through which one can induce a negative fat balance (the other being through altering diet [reducing caloric intake]). As such, prescribing an exercise regime that somebody doesn't enjoy is likely to affect their adherence to it, which is likely to compromise the likelihood of them achieving and sustaining a negative fat balance over time. Therefore, we would argue that when designing an exercise program, the first priority should be on identifying what the person enjoys and can stick to. Then, and only then, should one consider the use of fasted exercise as a potential means of increasing the efficiency of exercise for body fat loss.

It is also worth mentioning that studies have not yet established the location of the additional fat that is being mobilised and utilised as fuel during fasted exercise (subcutaneous, visceral, intra-muscular). This is important to consider from an aesthetic standpoint, given that the fat loss that matters most is that from subcutaneous fat (the fat lying directly underneath the skin). Usually during exercise, around half of the fat mobilised is from subcutaneous adipose fat tissue, with the other half coming from that stored in skeletal muscle (known as intramuscular triglyceride [IMTG]; van Loon 2004). The body adapts to regular exercise training by increasing the utilisation of IMTG such that the body can spare precious glycogen stores. Indeed, studies have demonstrated that the reliance on IMTG as a fuel during exercise is ~2-fold higher in aerobically trained versus untrained individuals (Romijn et al. 1993, Watt et al. 2002), and the contribution of IMTG rises to around 80% during prolonged steady-state exercise (120 min duration; Hurley et al. 1986). This could mean that increasing the use of fat as a fuel during exercise for the purpose of reducing body fat *may* become less relevant as one becomes more aerobically trained. Undoubtedly, further research is required to provide more resolution on this.

All things considered, the key is to understand the individual you are working with; taking into careful consideration the following:

(1) **The person's preferences -** do they enjoy training fasted or is it just another barrier to exercise? If they don't enjoy it - don't get them to do it. If they do - consider it.
(2) **Their daily routine -** is it practically applicable i.e., does it fit within their work / life schedule?
(3) **Their knowledge base -** do they understand what fasted exercise is and how they can implement it into their exercise regime? If they don't know how to do it, how can they be expected to get up and actually do it?!
(4) **Their training status –** important to manage expectations!

*"Exercise adherence is key! If somebody who is looking to lose body fat doesn't enjoy fasted exercise – don't get them to do it. If they do – consider it"*

# (7) FUTURE RESEARCH DIRECTIONS

Clearly, there is a need for future research to perform a series of carefully controlled longitudinal studies of exercise training in both the fasted and non-fasted state across a range of populations, which will help provide more resolution on the efficacy of fasted training from a body composition perspective. Also, to establish the sources of fat being utilised as fuel during fasted and non-fasted exercise (i.e., subcutaneous, visceral, intra-muscular fat), which could have implications for body composition, as well as metabolic health and exercise performance. From a practical standpoint, it might also be interesting to document and compare (on both a group and individual basis) the subjective responses to fasted versus non-fasted exercise i.e., session RPE and overall enjoyment, such as to determine the practical applicability of these approaches across a range of different people.

# (8) CONTEXT STATEMENT

We believe that fasted exercise is **not** the holy grail of body fat loss but it's also **not** just another fad. Undoubtedly, the first priority when designing a physical activity / exercise program to promote fat loss should be to identify the form(s) of exercise that the individual **enjoys** and is **most likely to adhere to** over the long-term, as this will reap the most rewards. Fasted exercise is a useful 'tool in the practitioner's toolbox' and could be used to increase the efficiency of exercise if the goal is to lose body fat. Its implementation should always be considered on a case-by-case (individual) basis, with the person's goals, preferences, work / life / exercise schedule, and also their knowledge and understanding of fasted exercise wholly accounted for.

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GURU PERFORMANCE

# GURU PERFORMANCE POSITION STAND #1 - FASTED TRAINING & BODY COMPOSITION

by Scott Robinson, Daniel Owens, and Laurent Bannock

1

Fasted exercise refers to training with reduced energy availability (typically achieved via carbohydrate restriction), usually at a low-moderate intensity

2

There are various ways to exercise fasted - the most popular method being to exercise before breakfast after an overnight fast

3

Most studies show that fasted exercise increases the use fat and decreases the use of carbohydrate as a fuel during exercise (a 20-30% increase in fat burning is often observed)

Recent research also shows that that this effect of fasted extends over a day. That is, daily fat oxidation is increased only when exercise is performed in the fasted, but not fed, state; an effect that was independent of energy balance (Shimada et al. 2013; Iwayama et al. 2015a; Iwayama et al. 2015b)

4

IN THEORY, such findings imply that fasted exercise, when performed in conjunction with a hypo-caloric diet, could help to accelerate body fat loss

5

HOWEVER, only a handful of longitudinal studies have looked into this, and the findings are mixed. Therefore, the potential superiority of fasted versus fed exercise in this respect is yet to be firmly established. Further work is required across a range of populations!

6

Consistently training in the fasted state could compromise training intensity and immune function. If you choose to exercise fasted, it would be important to perform some, but not all, sessions n the fasted state.

7

Fasted training, in conjunction with a hypo-caloric diet, could also have a negative effect on muscle mass. Consuming adequate protein before and/or during exercise (Impey et al. 2016), and regularly throughout the day will help offset this.

8

ADHERENCE is a key consideration when designing an exercise program for the purpose of fat loss. Fasted exercise could be a useful tool to accelerate the loss of body fat when a person is in a negative energy balance, but should only be considered when the individuals preferences, daily routine and knowledge-base have been wholly accounted for. That is, if they don't enjoy doing it, don't know how to perform it and/or it isn't practically applicable, don't get them to do it (it will just be another barrier to exercise!). If they do enjoy it, know how to do it, and it fits within their schedule - consider it!



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