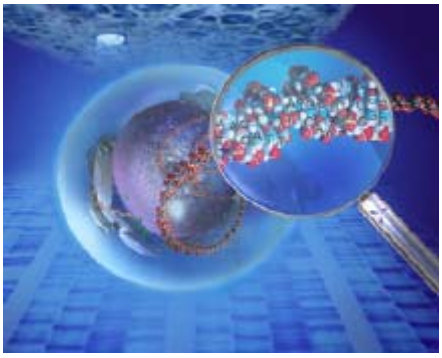
Active Recovery—A Three Fold Break Down



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Introduction - Active & Passive Recovery

Active and passive recovery methods are defined as follows:

- **A**ctive Recovery (AR)- performing sub maximal exercise, cardio, or posing, to promote recovery from hard-core training sessions.
- **P**assive Recovery (PR)- collapsing on a recliner from complete exhaustion, in an attempt to catch one’s breath and relax their muscles for the next workout or set in the iron jungle.

The question is, which of these techniques is most efficient for recovery? Today, we will dissect both of these methods. Fully elaborating from a physiological standpoint why and how they should be applied, while backing the claims made with the top scientific journals in the world.

How AR Works

Our focus this article will be on two products of active recovery:

1. Blood flow - AR's ability to deliver precious nutrients to your muscles, via blood born transport.
2. Lactic Acid clearance - the optimization of your bodies LA buffering system, utilizing AR.

The aforementioned results will be discussed in-depth within the following paragraphs. Furthermore, the application of them to your routine will be laid out, for 3 specific times: during exercise, post exercise, and during recovery days from your workouts.

Lactic Acid & its Effect on Athletic Performance

We discussed previously that one of the benefits to AR is its ability to assist lactic acid removal. Before we delve into how this is accomplished, we must establish why this is so vital to your success.

Problems with Lactic acid occur when the amount of free hydrogen ions (H+) surpasses your bodies buffering systems, effectively decreasing normal pH levels (acidity levels; the lower the pH is, the more acidic your blood becomes). When this occurs, the athlete will begin to feel pain, and suffer a decrease in athletic performance.

This pain is caused by an accumulation of hydrogen ions that stimulate pain nerves located in the muscle [14]. Performance decline is induced by both metabolic and muscular fatigue.

Metabolically, a decreased pH causes the inactivation of several enzymes [15], membrane nutrient transport mechanism inefficiencies [15], and energy decreased accessibility. To elaborate on energy deficiencies, glycogen catabolism is slowed by the inactivation of the enzyme glycogen phosphorylase; moreover, lactic acid inhibits the recruitment of fatty acids, minimizing their utilization. Due to these effects, carbohydrates are used at a heightened rate, and PC catabolism is increased, which further inhibits ATP regeneration. All of these factors ultimately lead to reduction in the production of ATP. Thus, decreased performance [1, 9,15].

Concerning muscular exhaustion, lactic acid promotes the restrain of the actomyosin ATPase, which breaks down ATP so it can provide energy for your body. In addition, H+ interferes with calcium uptake that is essential for muscular contractions. Increased lactate may also interfere with cross bridging [16]. These factors lead to a decline in both the force and velocity of muscular contractions.

As clearly displayed above, lactic acid can severely inhibit your athletic performance if not cleared out of your system. So finally, how do you help your body clear LA? By far, the most proficient mechanism is oxidation both during, and after exercise. Subsequently, we discuss how to accomplish this via active recovery.

During exercise recuperation

Lactic acid rapidly accumulates during high intensity exercise, heightened around 60-180 seconds. Consequently, this time frame is quite beneficial for muscular hypertrophy (for more information on this refer to the following article, Count To 60 seconds And Grow Man Grow). Accordingly, bodybuilders often deal with LA accumulation.

As discussed above, LA can be very detrimental for physical activity. Thus, any method that accelerates lactate removal would logically enhance athletic performance. Let's analyze what procedures would optimize recovery.

First, if you recall, lactic acid is best cleared through oxidation. So any movement that supplied your body with oxygen, would be of great assistance. The optimal procedure for this is low intensity aerobic (with oxygen) movements. Did you notice I said low intensity? Though high intensity aerobics would supply ample amounts of oxygen to your body, it would also induce higher levels of lactic acid, which is counter productive. The first lactate threshold has been shown to be between 40 % and 60% of ones VO2 max; however, this may be higher for the elite athlete. For recovery, you would want to perform movements below your lactic threshold, so that LA production is minimal, while oxygen consumption, and hence LA clearance is maximized.

Several scientific journals support the notion of applied *active recovery* between working sets. A perfect example would be sprinters, which are often dubbed the cousins to bodybuilders, due to their massive muscles achieved from high intensity, hypertrophy elicited movements. Here is an experiment that covers this very topic.

Active recovery was examined during repeated sprints [2]. 13 male athletes performed 2 maximum intensity sprints, separated with 4 minutes of either active recovery (cycling at 40% of their VO2 max), or passive recovery, on two separate occasions. Those who performed active recovery in-between sprints showed a much greater power output on the second sprint. They concluded that active recovery is superior to passive recovery for performance.

Another experiment was done on 16 subjects performing 4 exhaustive exercises, up to 2 minutes in duration [28] . These were separated by either passive, or active recovery methods. When analyzed, a more pronounced decrement in performance was found during passive recovery when the first and last exercises were compared,

while those who performed active recovery were able to maintain a higher performance. They concluded that active recovery enhanced the preservation of intensity during repeated maximal exercises. They attributed the benefits to a decrease in blood lactate levels.

I saved the best for last! Here is a fabulous study that is directly applicable to our sport. Fifteen resistance-trained males completed 3 workouts, each consisting of 6 sets of parallel squat exercise performed at 85% of 10 repetition maximum [20]. Each set was separated by a 4-minute recovery period. Recovery was randomly assigned from the following: passive sitting; or active 25% of onset of blood lactate accumulation (OBLA), and active 50% of OBLA. The results demonstrated that lower-intensity active recovery effectively minimized LA accumulation compared to passive or higher-intensity active recovery. Those who performed active recovery displayed a much greater maintenance of intensity, as the sets progressed. The data strongly supports that *"elimination of La occurs using low-intensity active recovery following intense resistance exercise and is associated with improved endurance performance in the squat exercise."* They suggested that, *"When attempting to improve large muscle resistance training performance an active recovery between sets should be used."* Here is some additional insight from the man that needs no introduction, President Wilson:

As Venom has so eloquently displayed, active recovery exerts many of its effects, by enhancing oxygen delivery to the musculature. One of the most vital keys in your understanding of this concept is once again centered around what Seyle, in the 1950's labeled as the "counter shock" phase of a stress reaction. To review - any activity which requires above resting levels of work knocks the body out of balance. It responds with a counter, by utilizing such mechanisms as increased epinephrine levels, or dilating certain blood vessels. You must realize that this study (of homeostatic reaction) is an intricate one. That is, differing activities stimulate differing reactions in the body, and therefore varying "counter shocks." Dynamic resistance training (lifting weights), for various reasons has been shown in several studies to actually lower stroke volume.

Cardiac Output = Heart Rate X Stroke Volume (blood ejected per beat - out of the heart)

While training intensely with weights, heart rate actually increases markedly, as you no doubt have noted. However, with a stagnant or lowered stroke volume, CO will only increase moderately, a predicament which will not optimally facilitate recovery. Venom however has the solution to this obvious problem. Active recovery between sets, utilizes a very aerobic (with Oxygen) protocol. During such activities, stroke volume notably increases, and with it, Cardiac Output. Boom! You're in and 02 levels to the working musculature is instantly - optimized!

For much more on how oxidation operates, how enhancing blood flow to the heart will dissipate LA, and much more, study, Energetic Transference Occurring in the Biosphere Part III: Lactate Clearance and Anaerobic Training Adaptations

I can go on, and on, the results are profoundly in support of active recovery between sets to promote lactate removal, and effectively enhance athletic performance [3,4,5,10,13,17, 20, 26,27,30,31].

My suggestion to accomplish this is to perform some light rhythmic movements between sets. The goal is to get your heart slightly up, between 29-40% of your VO_2 max, which is optimal for lactic acid clearance. This can be accomplished via moderate posing, dynamic stretches, light jogging in place, bike, a combination of techniques, or what have you. But, I would give yourself at least 30-60 seconds after active recovery to get mentally prepared for your set. You can apply this into your routine several ways. You can do it every set; you can save it for sets which induce the largest pumps, such as strips; or if you would like to maintain maximum effort between a grueling workout of parallel squats. It's up to you--go instinctive, have fun, and enjoy your gains.

Post Workout Recovery

The common term for post workout active recovery is known as the “cool down.” The goal at this time of the session is quite similar to that of during exercise recovery, in that, you want to assist your body the best you can in lactic acid removal. The half-life of LA lasts approximately 15-25 minutes after exercise, independent of total accumulation. However, active recovery can greatly reduce this time scale, potentially reducing LA down to normal resting levels when completed. The benefits to this are many. These are: maintenance of white blood cell count (effectively assisting your immune system), prevention of deactivated enzymes, all the inflictions induced from lactic acid accumulation in the body minimized, and much more. The reason why LA clearance is productive has been thoroughly displayed. Now lets see the results of putting active recovery into play from the pros.

Here is an extremely fascinating study. The effects of different recovery regimens on white blood cell count (WBCC) and muscle enzyme activities following strenuous, sub maximal, steady state workouts on a treadmill was examined [32]. 14 athletes participated in an intense run (70-80% of their VO_2 max) followed by either 15 minutes of passive recovery (complete rest), or 15 minutes of active recovery (running at 50% of their VO_2 max). The results showed that PR was associated with a 35% reduction in WBCC, compared to only a 6% decrease when using AR! They concluded that AR clearly prevents the initial drop in WBCC following strenuous training sessions.

Yet another study on AR’s benefits was conducted on 7 men following intense exercise for their forearm flexors, which caused LA accumulation, lowering pH [25]. After the exercise period, the subjects underwent active or passive recovery for 10 min. During AR, the pH increased immediately (higher pH means less acidity, which is beneficial) after the exercise period; whereas, in that of PR, it did not recover shortly after exercise. The results suggested that mild exercise was an effective maneuver to promote recovery from intramuscular metabolic acidosis.

Robert Carter III et al. postulated that women are more susceptible to acute post exercise orthostatic hypotension compared with men (A drop in blood pressure that is precipitated by changes in body position) [23] . To test this, they used 8 men and 11 women during inactive and active recovery from cycling exercise. Their findings suggested that women may have increased risk of post exercise orthostatic hypotension and that active recovery from exercise helps reduce this risk.

Lastly, we will discuss an excellent study on proper intensity levels for maximum results. Dodd S et al. began his experiment by stating, *“Numerous studies have*

reported that following intense exercise the rate of blood lactate (La) disappearance is greater during continuous aerobic work than during passive recovery." With this in mind, they performed a study on which type of active recovery was most beneficial for LA clearance [11]. Subjects performed 4 separate cool downs for 40 minutes; passive recovery, active recovery (cycling at 35% VO2 max, or at 65% VO2 max), and interval training consisting of cycling at 65% for 7 min followed by cycling at 35% for 33 minutes. The rate of blood LA disappearance was significantly greater in continuous AR at 35% VO2 max, compared with other intensity levels. They concluded that low intensity; continuous active recovery is most beneficial for LA clearance.

Tests show that you want to perform more than 5 minutes of active recovery post exercise for maximum results [6], but 20 minutes and over can be counterproductive, due to increased glycogen depletion, burning extra calories, ect. [8]. So a happy medium would be approximately 10-15 minutes of active recovery, at 29-40% of your VO2 max. You can do a rhythmic posing session, bike, or any other aerobic, continuous, low intensity exercise you may have available.

Blood

Leviticus 17:11

11 For the life of the flesh is in the blood… [12]

Blood carries innumerable vital nutrients throughout your body. A pump can assist several essential mechanisms such as protein synthesis and cellular hydration [33]. Now, if blood carries so many anabolic nutrients, then, is there a way to channel it for the benefit of muscular hypertrophy? Indeed, there is. In this next section of the article, we will analyze how to use blood flow to enhance recovery in-between workouts. First we need to elaborate on the aspect of blood flow, and its physiological effects.

Haussinger D et. al [18] displayed evidence that cellular hydration is an important factor for controlling cellular protein turnover; while protein synthesis and degradation are affected inversely by cell shrinking. Moreover, an increase in cellular hydration (swelling) acts as an anabolic agent; whereas, cell reduction is catabolic.

Waldegger S et al. [34] concluded from his experiment that, "Cell swelling inhibits proteolysis (protein breakdown), and stimulates protein synthesis, whereas cell shrinkage stimulates proteolysis and inhibits protein synthesis"

Brad Schoenfeld [7] displayed that a hydrated cell stimulates protein synthesis and inhibits proteolysis. In effect, providing muscles with the raw material to lay down new contractile proteins (myosin and actin).

Additionally, Millar ID examined the effect of cell volume on protein synthesis [21]. The results strongly suggest that cell volume is an important cellular signal for the control of protein synthesis in general.

So as clearly displayed, blood flow is a highly anabolic agent. Next, we discuss how to use these findings for our advantage.

Between Workouts recuperation

Athletic performance is regularly impaired by soreness. Thus, any application that limits the extent of damage or hastens recovery would be of interest and practical value to soldiers of the iron jungle. Muscular aches often occur after a hard-core training bout. These pains typically peak 24–48 hours after exercise, and are known as delayed onset muscle soreness (DOMS).

Countless hours of scientific research have been dedicated to optimal recovery from DOMS. Active recovery, once again, shows great promise to the elite athlete. Consider the following studies:

It has been established that a highly effective mean for reducing DOMS is through active resisted exercise of the affected muscle groups. Hasson et al. [19] investigated the use of light exercise in the treatment of DOMS 24 hour's post-eccentric quadriceps training. A significant reduction in symptoms was demonstrated.

Tiidus et al. is a major advocate of AR for DOMS. Through several experiments [24,29] he has shown that for elevated muscle blood flow through low intensity exercise would be of great benefit, and would *"thereby enhance healing and temporarily reduce delayed onset muscle soreness. [29]"*

Here is an additional study from President Wilson's [22] excellent article, Hippocrates - Was He Hardcore?:

> "Sayers et. al compared a lighter training session (active recovery) compared to pure rest. Eight subjects rested after a taxing elbow flexor workout, while nine performed a lighter training session to aid recovery. The results showed that strength recovery was better after light exercise when compared with

> just rest. This study confirms, that even if you do not perform split volume training, that a light training session while the muscle is recovering can be very beneficial."

The results are clear: performing AR during recovering periods is of great assistance for alleviating DOMS, expediting recovery, and improving athletic performance.

In order to achieve these benefits, I would recommend performing a few light, high rep resistance training exercises. Remember, the goal is to enhance blood flow to the area, but at the same time, avoid any micro trauma to your muscles. As such, the weight should be of minimal resistance (warm up weight preferably), and approximately 20 reps plus. Studies show eccentric training causes extreme muscular damage (refer to the following article for extensive research on this, Cliff Hanger Part I). As such, it would behoove the participant to avoid tension on this portion of the repetition. If you have a training partner, I would recommend you perform Concentric Super Overload. Have him, or her, take the weight on the eccentric portion of the rep, while you lift on the concentric portion. If you do not have a partner, just perform a 1 second eccentric repetition per rep. The concentric aspect of the lift should last 1-2 seconds. 2-5 sets per muscle group should do the trick. A sample workout for forearms would entail 2 sets of 20 reps with reverse barbell wrist curls, and 2 sets of 20 reps with barbell wrist curls, using minimal resistance. Also, choose an exercise in which you have developed a proficient mind muscle connection with, and can achieve maximal blood flow to the targeted body part. You can use AR in-between every workout, or save it for the times when your body is absolutely destroyed from a given session, and DOMS are sky rocketed. Try both, and adjust as you see fit.

Conclusion

Spiritually, mentally, and physically, recovery is essential to every aspect of our lives. Don't find yourself deficient.

Isaiah 40:28-31 [12]

> *28 Hast thou not known? hast thou not heard, that the everlasting God, the LORD, the Creator of the ends of the earth, fainteth not, neither is weary? there is no searching of his understanding. 29 He giveth power to the faint; and to them that have no might he increaseth strength. 30 Even the youths shall faint and be weary, and the young men shall utterly fall: 31 But they that wait upon the LORD shall renew their strength; they shall mount up with wings as eagles; they shall run, and not be weary; and they shall walk, and not faint.*

Keep it Hardcore

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