Top 5 Performance Enhancers for Fitness

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Take Away Points:
1. Sleep is referred to as "the athlete's steroid." The ultimate recovery strategy.
2. Proper hydration helps clients work-out harder and longer.
3. Post-workout snacks start the process of repair and preparation for the next workout.
4. Foam rolling can decrease delayed onset muscle soreness acutely and chronically.
5. Selecting the best circadian time can increase performance by 10%.

1) Sleep

Proper sleep helps contribute to a healthy immune system.

With enough hours of restorative sleep, it's easier to work, learn, create, and communicate.

Slow wave sleep is associated with:
- decreased heart rate
- normal blood pressure
- lowered sympathetic nervous response (fight-or-flight response)
- lower cerebral glucose utilization.

Good sleep causes improved cognitive functions and makes it easier to perform the complex tasks and improves memory.

Cardiovascular health: proper sleep has been linked to decreased hypertension, stress hormone levels (cortisol), and heartbeat.

"A universal recovery strategy that is essential to both physiological adaptation and to the consolidation of skill development is sleep." Gordon Sleivert, Ph.D., Canadian Sport Centre Pacific.

Cheri Mah, Ph.D., Stanford Sleep Disorders Clinic:
"sleep is an important factor in peak athletic performance"
"athletes may be able to optimize training and competition outcomes by identifying strategies to maximize the benefits of sleep."

"Sleep duration may be an important consideration for an athlete's daily training regimen."

Primary reason performance and fitness can improve - body releases human growth hormone, which stimulates healing and growth of muscle, tendon and bone.

Proper sleep helps athletes and fitness in two ways:
1. Boosts performance by improved cognitive function, reaction time, and hand-eye coordination.
2. Aids recovery from games and workouts. Sure bet for our clients wanting the added advantage from their work-outs.

Clients will get a better work-out because good sleep helps with productivity and concentration, increased energy, and improved mood.

Mah (2008) college swimmers increased sleep to 10 hours/night for 6 – 7 weeks:
- swam 15-m sprint 0.51 seconds faster
- reacted 0.15 seconds quicker off start blocks
- improved turn time by 0.10 seconds

Mah, et al., (2011) college basketball increased sleep to 10 hours/night improved performance:
- faster timed sprint – 0.70 sec (baseline to half-court, back to baseline, full-court, back to baseline)
- free throw percentage increasing - 9.0%
- 3-point field goal percentage increased – 9.2%.

Mah (2010) 7 Stanford University football players - 18 to 22 years.
"… athletes began season with moderate levels of daytime sleepiness and fatigue."
- aimed for a minimum of ten hours of sleep each night.
- 20-yard shuttle run time decreased 4.71 → 4.61 sec
    - 40-yard dash time decreased 4.99 → 4.89 sec
    - Daytime sleepiness and fatigue also decreased significantly, while vigor scores significantly improved.

Schwartz & Simon (2015)
7 females, 5 males, college varsity tennis team.
Normal sleep-wake schedule for 1-week - 7.25 hrs sleep.
One-week sleep extension – 9 hrs sleep.
Serving accuracy tested during "normal" sleep and during sleep extension.
Serve accuracy improved - 6.1% (statistically significant).

2) Hydration

"Copious and clear" is what we could be telling our clients about their urine relating to hydration.

Dehydration reduces blood volume, makes blood thicker, increases heart rate, and makes it more difficult for the body to lose heat. When a client is dehydrated exercise will "feel" more difficult, causing clients to decrease exercise intensity and/or want to stop their work-outs early.

Postworkout and recovery - athletes should drink 16–24 oz of fluid for every pound of body weight lost during activity.

Complete rehydration requires sufficient sodium and potassium replacement and extra fluid intake exceeding that which is lost in sweat and urine during activity.

When exercisers are provided plain water, most only replace a fraction of their fluid losses because water turns off thirst too soon.

Lightly flavored waters with few calories (often <25 Kcal/serving) and can help hydration by stimulating drinking. Exercisers drink more when given a flavored beverage.

Three main goals of sports drinks, 1) prevent dehydration, 2) replace electrolytes (primarily sodium and potassium) lost in sweat, and 3) provide carbohydrates for use during exercise.

Milk and/or chocolate milk are good choices for hydration and refueling.

Sodas, even diet ones, get a bad rap, but can still be hydrating.

Juices and sports drinks are also hydrating and the sugar content can be lowered by diluting them with water.

Aging causes changes:

- in body water composition
- renal function
- thirst perception declines

(Davies, et al., 1995, Malmrose, et al., 1993, & Lindeman, et al, 1985).

Dehydration can be a side effect of diuretics, diarrhea, and diabetes.
Aging itself makes people less aware of thirst and also gradually
lowers the body's ability to regulate its fluid balance.

Hydration for Fitness Pro's
Fluid is lost by projecting voice.
Dehydration increases amount of pressure required to initiate vocal sounds.
Dehydration reduces viscosity in the vocal folds/cords.
(Verdolini-Marston et al., 1994; Verdolini et al., 2002).

The Effect of Caffeinated, Non-Caffeinated, Caloric and Non-Caloric Beverages on Hydration
Grandjean, A.C., et al. *J Am Coll Nutr*. 2000
Coffee and tea also count. We used to believe they were dehydrating but this myth has been debunked. The so called diuretic effect does not offset hydration.

18 healthy males
- crossover study
- combination of four different beverages

1. Caffeinated cola
2. Caffeine free cola
3. Coffee
4. Spring water

CONCLUSION:
No significant difference between the fluids for hydration status.
The source of fluid doesn't matter when the outcome is hydration.
Advising people to disregard caffeinated beverages as part of the daily fluid intake is not substantiated by the results of this study.

3) Post-Workout Snacks, Meal, Drink
Position stand - International Society of Sports Nutrition Nutrient Timing (Kerksick, et al., 2008).

Post work-out snack is accentuated when the exercise is 60 – 90 minutes of moderate to high intensity exercise that reduces glycogen stores.

Post-exercise (within 30 minutes) consumption of a carbohydrate snack (8 – 10 g CHO/kg/day) has been shown to stimulate muscle glycogen re-synthesis.
Adding protein (0.2 g – 0.5 g PRO/kg/day) to the carbohydrate snack at a ratio of approximately 3:1 (CHO:PRO) has been shown to stimulate glycogen re-synthesis to a greater extent.

Ingestion of 6 – 20 grams of essential amino acids and 30 – 40 grams of high- glycemic carbohydrate within three hours after exercise, and immediately before exercise, has been shown to significantly stimulate muscle protein synthesis.

Daily post-exercise ingestion of a carbohydrate and protein snack stimulates greater increases in strength and improvements in lean tissue and body fat % during resistance training.

Pritchett and Pritchett (2012) indicate that chocolate milk is an affordable recovery beverage for many athletes. Low-fat chocolate milk consists of a 4:1 CHO:PRO ratio and provides fluids and sodium to aid in post-workout recovery. Consuming chocolate milk immediately after exercise and again at 2 hours post-exercise appears to be optimal for exercise recovery and will help repair muscle damage.

4) Foam Rolling

MacDonald, et al., (2014) investigated the effectiveness of foam rolling on muscle soreness, range of motion, voluntary contractile properties, and vertical jump height. Authors conclude the most important findings of the study are that foam rolling was beneficial in decreasing muscle soreness while improving vertical jump height, muscle activation, and passive and dynamic range of motion.

MacDonald, et al., (2013) investigated if foam rolling would reduce delayed-onset-muscle-soreness in 20 physically active, male subjects with resistance-training experience.
10 sets x 10 reps of squats at 60% of 1RM, 4-sec eccentric and 1-sec concentric, 2 minutes rest between sets.
The researchers found that muscle soreness was significantly reduced in the foam rolling group in comparison with the control group at 24, 48 and 72 hours post-workout.

Jay, et al., (2014) investigated the effect of roller massage on hamstring soreness in 22 healthy untrained subjects. All subjects performed 10 sets x 10 reps of stiff-legged deadlifts with a kettlebell, 30 sec of rest with tempo of 1 – 2 sec for the concentric and eccentric phases. Forty-eight hours post-workout, the subjects returned and rated their hamstring soreness using a visual analogue scale, and the researchers tested their pressure pain threshold through palpation. Measurements of soreness, pressure pain threshold and flexibility were taken before and at 0, 10, 30 and 60 minutes post-foam rolling. The researchers indicate that the roller massage group displayed significantly reduced soreness and greater pressure pain threshold compared with the control group at 0, 10 and 30 minutes post-massage.

The effects of self-myofascial release using a foam roll or roller massager on joint range of motion, muscle recovery, and performance: a systematic review.
Cheatham, et al, 2015. Int J sports phys ther.
As of 2015, no reviews of literature on the effects of foam rolling/roller massage on joint range of motion, muscle recovery, and performance.
Review research to answer the following questions:

1. Does foam rolling/roller massager improve ROM without effecting muscle performance?
2. After intense exercise, does foam rolling/roller massager enhance post exercise muscle recovery and reduce delayed onset muscle soreness (DOMS)?

3. Does foam rolling/roller-massager prior to exercise affect muscle performance?
RESULTS:
Foam rolling/roller massager appears to have short-term effects on increasing ROM without negatively affecting muscle performance.
May reduce decrements in muscle performance and DOMS after intense exercise.
Short bouts of rolling prior to exercise do not appear to effect muscle performance.

Athletic Performance

The current evidence suggests that foam rolling does not adversely affect athletic performance measures, such as muscular strength, power, jumping and agility. Additionally, it seems that in this respect, foam rolling is superior to static stretching (Halperin, et al., 2014 and Sullivan, et al., 2013).

5) Training During a Clients' High Circadian Rhythm

Circadian rhythms are physical, mental, and behavioral changes that follow a 24-hour cycle, responding primarily to light and darkness.
(http://www.nigms.nih.gov/Education/Pages/Factsheet_CircadianRhythms.aspx)
Regulate periods of sleepiness and wakefulness through day/night.

Chronotype . . . Determines if we are a "morning person,"
"afternoon person," or a "night person."

Generally, peak performances occur in the early evening, at the peak of core body temperature.
Increase in core body temperature =

- increases energy metabolism
- improve muscle compliance
- facilitate actin-myosin cross bridging

Circadian Rhythms in Exercise Performance: Implications for Hormonal and Muscular Adaptation
Teo, Newton, & McGuigan, 2011, *Journal of Sports Science and Medicine*, 10, 600-606

Aerobic
Swimming
Arnett (2002)
Arnett (2001)
Martin and Thompson (2000)
Cycling
Atkinson et al. (2005)
Edwards et al. (2005)
Reilly and Garrett (1998)

Increased performance capability and VO2max in later part of the day.
Increase in performance highly correlated to high body temperature later in the day.

Cycling/Wingate – Anaerobic
Souissi et al. (2007)
Bessot et al. (2007)
Bessot et al. (2006)
Giacomoni et al. (2006)
Moussay et al. (2003)
Souissi et al. (2002)
Bernard et al. (1998)

Hill et al. (1992)
Reilly and Down (1992)
Resistance/Plyometrics
Taylor et al. (2011)
Teo et al. (2011)
Pereira et al. (2011)
Sedliak et al. (2008)
Sedliak et al. (2008)
Sedliak et al. (2007)
Bird and Tarpenning (2004)
Kraemer et al. (2001)
Häkkinen et al. (1988)

Anaerobic fitness, strength, and power significantly higher later in the day.
Performance is correlated to increase in body temperature.
Better coordination between agonist-antagonist contractions.

"Selecting the best circadian time can result in as much as a 10% increase in athletic performance."

Studies of professional athletes have found teams traveling from west to east, rather than east to west, to perform well (basketball, baseball, or football). Researchers surmise that players traveling from west to east are more likely to be playing at the time of peak circadian performance.

1997 Stanford scientists evaluating data from 25 years of Monday Night Football. West coast teams won more often, won by more points, and performed better than predicted by the Las Vegas point spread.
Selecting the west coast team without considering any other variable successfully predicted the winner against the point spread 67.9% of the time.

Research Citations

Halperin, I. et al., 2014, Roller massager improves range of motion of plantar flexor muscles without subsequent decreases in force parameters. *Int J Sports Phys Ther*, 9(1):92-102.

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Pritchett, K. and Pritchett R. 2012, Chocolate milk: a post-exercise recovery beverage for endurance sports, *Med Sport Sci*. 59:127-34. doi:10.1159/000341954. Epub 2012 Oct 15.

Sullivan, K.M., et al,. 2013, Roller-massager application to the hamstrings increases sit-and-reach range of motion within five to ten seconds without performance impairments, *Int J Sports Phys Ther*. 8(3): 228–236.