



THE COMPLETE GUIDE TO PRE-WORKOUT SUPPLEMENTS

BY HOBART SWAN | JULY 08, 2021

In the last few years, pre-workout supplements have become nearly as popular among gym-goers as protein. But just like protein supplements-and like athletes-not every pre-workout product is the same, nor is every pre-workout product suitable for every athlete. Each one has different ingredients in different doses with different intended effects, and might be suited to different types of athletes with different goals.

Whether you're looking to set a new PR, get a few more reps, or just get the most out of your cardio, a good pre-workout can be your ally.

In the following guide, we'll talk about how to choose the right pre-workout for you, and how to get the most from it. Educate yourself, and feel confident that your pre-workout will help you reach your fitness goals!

WHAT IS A PRE-WORKOUT SUPPLEMENT?

Pre-workout supplements include all the ingredients that people take with the singular goal of making their workouts more effective. The name literally means it's something you do prior to a workout, game, or match.

"In the hour prior to training, you should be focused on priming your internal environment for hard physical and mental work," explains Dwayne Jackson, Ph.D. "Therefore, pre-workout supplementation should optimize your mind and body to maximize performance."

However, that "optimization" can mean several things. In many cases, pre-workout supplements provide extra energy or focus. But they can also impart specific physical benefits. For example, one type of athlete might appreciate the increased pain tolerance or force-production it provides during an all-out effort, like a heavy rep test on the "big three". Another might appreciate the endurance to knock out a few more reps in high-volume DTP sets. Vasodilators and other ingredients can help increase blood flow to muscle tissue, boosting recovery and endurance.

The most common ingredients in today's popular pre-workouts include caffeine, beta-alanine, leucine or BCAAs, and nitric oxide boosters such as Nitrosigine, arginine, or citrulline, all of which appear to help increase blood flow and the "pump" feeling during lifting. However, new blends with new ingredients come out all the time.

Pre-workouts can be divided into two groups: those with stimulants, and those without. The stimulants pretty much always include caffeine, in widely varying doses, but may include other stimulants including yohimbine, theacrine (Teacrine as the most common), guarana, and many others. Many supplement companies have developed stimulant-free pre-workouts for those who are sensitive to caffeine, simply don't want it, or who exercise close to bedtime.

If you're looking for a pre-workout that will make you feel amped up and ready for action, you'll find no shortage of them out there. However, if that's exactly what you don't want, you still have choices. And many pre-workouts fall in the middle, with no more caffeine than a cup of tea or coffee.

All of this is why it's essential to read labels, read plenty of user reviews, and buy pre-workouts from established, reputable companies.

DO PRE-WORKOUT SUPPLEMENTS WORK?

Honestly, it depends on what you're taking them for. Some people take a pre-workout thinking it will make them bigger, stronger, or faster. It probably won't, but it can certainly help you crush an important workout. And if you crush lots of workouts, over time, that can definitely help you become bigger, stronger, and faster!

Remember, the main purpose of pre-workouts is not to directly build muscle or improve your physique, it is to give you the energy, endurance, and focus to perform the exercises that can help you reach both of these goals.

There are plenty of studies showing that most of the individual ingredients in today's most popular pre-workouts provide some benefit in strength, endurance, or muscle growth. But those subjects' training history and workouts may be dramatically different than yours.

Short answer: Yes, a pre-workout can help you have a better workout. But the truth is that it's just one factor of many. Get your training right. Build your nutritional foundation. Optimize your recovery with plenty of sleep. And then use supplements to help you crush that last 5 percent of the project!

WHAT INGREDIENTS ARE IN HIGH-QUALITY PRE-WORKOUTS?

The label on some pre-workouts looks simple enough. In other cases, it's a laundry list of difficult-to-pronounce words and secretive-sounding "blends" or "matrixes." Plus, with so many different brands and products, it can be hard to know what makes one better than the other.

Especially if you're just starting out, it's usually better to keep it simple. Here are four key ingredients to look for, and how they help you have a better workout:

1. Caffeine

Many lifters and other athletes consider caffeine their best training partner, and for good reason. "Study after study has shown that caffeine can increase alertness, sharpen focus, improve tolerance for pain caused by exercise, help burn fat, and help athletes do more work for longer periods in the gym and in sport," writes Robert

Wildman, Ph.D., RD, RISSN, in the article "Boost Your Workout With Caffeine."



Caffeine gives you quick energy you can use for both endurance exercise and shorter duration, high-intensity work such as lifting or sprints. It has been shown to increase maximal strength, power, endurance, and even reduce muscle soreness[1].

Sound effective? It definitely is. "In fact, caffeine works so well that, up until 2004, its use was banned by the World Anti-Doping Agency," says Wildman. Fortunately, the ban ended, and since then, he notes, "More than 75 percent of elite athletes routinely use caffeine during competition." And the rest of us do, too—upward of 80 percent of Americans use caffeine daily!

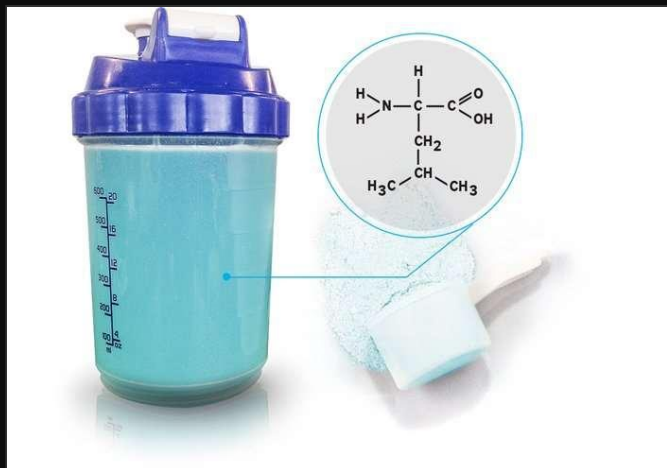
Some people are caffeine-sensitive no matter what the dose is, while others seem oblivious to the physiological effects of it. Research has also shown that you can build a tolerance to caffeine, though this tolerance will not interfere with the physical performance-boosting benefits of caffeine [2,3]. Some individuals perceive that they have built up a tolerance to the product they are using, and simply change pre-workouts every few months to see if just the "change of scenery" helps.

Please be aware that for those who are caffeine-sensitive, it is best to avoid or limit caffeine

intake after 4 p.m. (assuming you are not an overnight worker), as it may interfere with sleep or sleep quality. For those who are caffeine-sensitive and train at night, non-caffeinated products are likely a better option.

2. BCAAs Or EAAs

Provided you are consuming adequate calories and protein, the branched-chain amino acids of leucine, isoleucine, and valine help you by regulating protein metabolism, which means increasing protein synthesis and decreasing protein breakdown. In other words, BCAAs help you build muscle and minimize muscle damage. Taken pre-workout, they can also help decrease delayed onset muscle soreness (DOMS) so you can get back to training hard faster, and they reduce mental and physical fatigue during a workout.[4]



The most popular and science-backed ratio for BCAAs is 2:1:1—two parts leucine to one part isoleucine and one part valine. You want more leucine because research has shown that it's the best amino at stimulating muscle protein synthesis. If the brand you're interested in doesn't list a ratio, look for at least 3 grams of leucine per serving.

All of the benefits of BCAAs can also be obtained by taking essential amino acid blends, or EAAs, which are increasingly popular in pre-workouts and standalone amino blends. After all, BCAAs are part of the EAAs. The EAAs include the three BCAAs, as well as six other amino acids that your body can't produce on its own.

3. Beta-Alanine

Beta-alanine is a staple pre-workout ingredient with a singular purpose: helping you withstand that "burning" feeling and bust out a few more reps, making the most of every set.

When you perform high-intensity exercises, acidity can start to build up in your body, increasing muscle fatigue and reducing performance. Beta-alanine binds with histidine to raise levels of the amino acid carnosine, which buffers the hydrogen ions that form these acids, ultimately helping you maintain your intensity for longer periods of time. In other words: more volume; more gains. [5]



If you take a larger dose of beta-alanine, as is in many pre-workouts, you will most likely experience a tingling sensation, often on the neck and face. This is a condition called "paresthesia," and the first time someone takes a pre-workout, they often notice it as much as the caffeine.

Scientists are not certain why some people experience paresthesia after taking beta-alanine, but it is harmless and temporary.

However, beta-alanine's benefits come with a catch: It needs to be taken consistently for 2-3 weeks before the results start to appear. Luckily, you don't need to take beta-alanine right before a workout, though. If you take it in smaller doses throughout the day, it will provide the workout benefits with less tingling. The International Society of Sports Nutrition recommends a dose of 4-6 grams of beta-alanine per day, split up as necessary. [6]

4. Nitric Oxide Boosters

These are the pre-workout ingredients that boost blood flow to muscles, and help you get a serious pump during high-rep lifting. Once upon a time, L-arginine was the most popular NO booster, but on its own, it is fairly rare these days. Today, there are many different ingredients that may help with NO production, but the most popular is probably the non-essential amino acid citrulline, either in the form of L-citrulline or citrulline malate.



L-citrulline is the natural form of citrulline, found in watermelon. It helps boost nitric-oxide levels, which can help dilate your blood vessels to get

more oxygen and nutrients to your muscles. As nutritional consultant Mike Roussell, Ph.D., notes in the article "Citrulline Malate: The Fatigue Fighter," it also plays a role in the removal of ammonia, a compound known to cause exercise-related fatigue, from your blood.

Citrulline malate is L-citrulline to which malic acid, or "malate," has been added. Aside from the boosted blood flow that comes from the citrulline, "Malate is also thought to have fatigue-fighting capabilities of its own, by supporting the body's own ability to recycle exercise-generated lactic acid and use it for energy," notes Roussell. This one-two combo can mean improved endurance during a workout-i.e., more reps before failure-and even a decrease in muscle soreness.[7]

OTHER INGREDIENTS

It seems like every day, a new pre-workout comes out with big potential and a science-backed dosage of ingredients. A few of the most popular include:

- **L-tyrosine:** For improved energy and fatigue-resistance
- **L-theanine:** For increased mental focus and to combat the "jitters" that can accompany caffeine
- **Huperzine-A:** For mental energy
- **Yohimbine:** For increased energy and mental intensity
- **Nitrosigine:** A unique form of arginine for increased blood flow, reduced muscle damage, and for greater concentration
- **Beetroot extract:** For endurance and pumps

- **Betaine:** For long-term strength, size, and recovery gains

What about creatine? Many pre-workouts contain it, and there's no downside to taking it before your workout. However, it's not demonstrably better at this time than any other. More important than when you take creatine is simply that you take it consistently.

This is by no means an exhaustive list! If you see something new that you don't recognize on a pre-workout, do your research to make sure it's something you want to take. And only buy pre-workouts from established companies that engage in third-party testing and don't make outlandish-sounding claims.

WHEN SHOULD I TAKE A PRE-WORKOUT?

You often see people drinking their pre-workout as they're walking into the gym, or even out of the locker room. This is one gym habit that you shouldn't copy if you want yours to be as effective as possible!

Here's why: "Most of the active ingredients in your pre-workout drink take 30-60 minutes to reach peak levels in your blood," writes Krissy Kendall, Ph.D. "If you wait until you reach the gym to take it, you'll be well into your second or third exercise before the full effects kick in."

If you take your pre-workout earlier than that, like 60-90 minutes, you'll still have enough energy to get through even a pretty long workout. Most pre-workouts contain caffeine, and it takes your body 3-5 hours to cut the concentration of caffeine in your blood in half. That's how long a normal pre-workout can be said to "last,"

although everyone metabolizes caffeine at different rates.

For that reason, an equally important concern is whether you're taking your pre-workout too late, especially if you work out in the late afternoon or early evening. Since many pre-workouts contain large amounts of caffeine, taking them too late in the day may harm your sleep. That's a big deal because getting enough sleep is one of the most important factors for recovering from your hard work in the gym. Lack of sleep can even mean more body fat!

Then there's the question of how often you should take a pre-workout. Lots of people take pre-workout before nearly every workout. The only downside to this approach is that because caffeine is technically addictive, you may become more tolerant of its effects and need to take increasing amounts of it to get the same energy boost.

For this reason, many coaches and athletes recommend saving a pre-workout for important workouts, especially intense ones, or routines that focus on larger muscle groups like legs, back, or chest.

WHO SHOULD OR SHOULDN'T TAKE A PRE-WORKOUT?

This is a complicated question! If you only go to the gym to get a light sweat, then a pre-workout may not provide much benefit. But if you're someone who wants to turn serious training into serious results, a pre-workout can help. Say you're four weeks in to a program, and you know you need a boost to make it through a leg day with cardio acceleration. You're hungry and sore,

but the workout must be done! This is the mindset that leads many to take their first pre-workout.

Anyone who feels like they need an energy boost in the gym, or who has an ambitious PR in their sights, is a prime candidate for a pre-workout supplement. However, even with the best pre in your gym bag, the best benefits are achieved over time with consistent training, continued use, adequate nutrition, and appropriate rest and recovery.

There's a good reason exercise physiologist Krissy Kendall, Ph.D., includes the pre-workout staple ingredients of caffeine, BCAAs, citrulline malate, and other NO boosters on her list of "The 8 Best Supplements for Strength Athletes and Bodybuilders."

However, if you know that you're highly sensitive to caffeine, you may benefit more from a low-stimulant or stimulant-free pre-workout. Since many pre-workouts do contain stimulants and some of them contain a lot of stimulants-check with your doctor first if you have any health conditions that might cause adverse reactions to them.

Parents should also be cautious about giving a stim-heavy pre-workout to adolescents, and no, they're not a good idea for young children. If your child is getting serious about training, tell them they should be able to motivate themselves to get to the gym and work hard first. The intensity-boosting supplements can come later, after they've built a solid foundation.

CAN'T I JUST HAVE COFFEE OR AN ENERGY DRINK BEFORE A WORKOUT?

Good point! A strong cup of tea or coffee, or a can of your favorite energy drink, definitely has some of the same performance-boosting potential as a pre-workout. After all, caffeine is an undeniable pre-workout powerhouse! It can increase endurance, strength, and power while lowering your sense of fatigue. It can make you more alert, able to summon power more quickly, and help you focus during a difficult set.

That said, a simple caffeinated beverage is a one-dimensional fix, whereas a pre-workout is a multi-dimensional solution.

"When it comes to the specific challenges of hard training, you may be shortchanging yourself by relying on energy drinks alone," writes exercise physiologist Nick Coker in his article "Transform Your Energy Drink into a Pre-Workout Powerhouse."

If you're going to use an energy drink in the place of a pre-workout, Coker suggests taking extra amounts of key pre-workout ingredients, such as citrulline malate. And honestly, if you're trying to get the most out of a workout, it's also a good idea to take a hard look at what-if anything-you're eating in your pre-workout meal.

"While caffeine can help you crawl through your day without eating much, it's been shown to be more effective at delaying workout fatigue when combined with carbs," Coker says. "Whatever meal you choose, aim for 35 grams of carbohydrates and at least 6 total grams of

essential amino acids, or around 20 grams of high-quality protein."

WHAT IF I'M SENSITIVE TO STIMULANTS?

In a world full of people slugging down caffeinated drinks all day, people who don't want or need caffeine can sometimes feel like second-class citizens. But in the gym, you can get many of the same benefits as people who take leaded pre-workouts. And as an added benefit, you won't find yourself shaking so hard the bar falls from your hands.

Research has shown that genetics play a significant role in caffeine sensitivity: Some people are highly affected by it, some aren't affected at all, and some are in between. Whether you are highly sensitive to caffeine, just don't like it, are trying to break a pre-workout-stimulant habit, or you work out late at night and don't want your sleep interrupted, non-stimulant pre-workouts offer a good alternative.

If you're looking for a single ingredient or two that could help your workouts, exercise physiologist Nick Coker labels these "The 4 Best Caffeine-Free Supplement Ingredients to Boost Your Workout."

- **Citrulline malate:** For increased blood flow and endurance
- **Theacrine:** For the same benefits of caffeine, without an energy crash or dependency issues
- **Alpha-GPC:** A neurotransmitter prerequisite to help the nervous system maximize muscle activation

- **Betaine:** For longer-term size and strength gains

On the non-supplement end of things, a snack rich in carbs and protein 1-2 hours before a workout may be the best pre-workout you're not taking. Getting these calories and nutrients before a workout can give you long-lasting energy that'll power you even through long workouts. Avoid pre-workout snacks with a lot of fiber and fat, which take longer to digest and, for some people, can cause stomach upset during intense exercise.

HOW CAN I PREVENT FEELING JITTERY AFTER I TAKE A PRE-WORKOUT?

Depending on how potent your pre-workout is, and how your body responds to caffeine and other stimulants, some jittery feelings may be inevitable. However, many pre-workouts these days contain stimulants that are reputed to feel "smoother" than straight caffeine, such as theacrine, or they feature calming compounds to "take the edge off" of caffeine, such as L-theanine.

Keep in mind that the International Society of Sports Nutrition indicates that if dosing caffeine based on body weight, the range for optimal effectiveness is 3-6 milligrams per kilogram or 1.3-2.7 milligrams per pound of body weight. [1] For a 150-pound person, this would be a range of 204-408 milligrams of caffeine. That's a big range! Know where your pre fits in it before you take it, and if you've only ever taken 100 milligrams of caffeine at a time, perhaps don't jump right to 350 milligrams before an important workout.

That said, you can also take some control of the situation by paying more attention to your other pre-workout nutrition.

"If you ever drink coffee on an empty stomach, you know the feeling: light-headed, jittery, and sometimes even nauseous," explains Krissy Kendall, Ph.D. "If you drink a pre-workout with 200-300 milligrams of caffeine without eating anything, you can feel exactly the same way."

The answer, Kendall says, is to treat your pre-workout meal just as seriously as you treat your pre-workout supplementation. "Having a small meal 30-60 minutes before you take your pre-workout can help minimize side effects like these," she says. "Plus, those extra nutrients will help you push through your workout."

ARE PRE-WORKOUTS SAFE?

There's no doubt that some supplement companies have made headlines for the wrong reasons in recent years. And pretty much every lifter can tell you a story about the time they took a stim-heavy pre-workout that was a bit more intense than they expected. However, as long as you follow a few straightforward rules, you can have a safe and productive training session after taking a pre-workout.

First and foremost, go in with your eyes open! Know what you're taking. Make sure you buy your pre-workout from a reputable, established company, preferably one whose products have been tested and approved by an independent third party. Informed-Choice is one such testing organization. Informed-Choice tests about 18,000 samples a year for contamination by banned substances, and to verify that what is on the label

of your pre-workout matches exactly what's in the bottle.

If you know what you're taking, the next step is to know yourself, and why you're taking a pre-workout in the first place. Is it to get a specific extra edge for your specific workouts, or is it just a way to try to motivate yourself into training? Are you comfortable with stimulants, or do you know they make you feel anxious and unpleasant, or struggle with insomnia? Is your training and nutrition in order, or are you hoping that a pre-workout will magically give you results? Answer these questions before you click "buy," and remember that a pre-workout is just the icing on the cake. Training consistently and eating right-those are the real keys.

More specifically to young athletes, there are no legal age limits for the use of pre-workouts nor for any other exercise-related supplement. And sure, a pre-workout may be "safe" for, say, a teen athlete, but that doesn't mean it's necessary or even helpful. A teen athlete or lifter would get more from simply eating right and training regularly than from taking any particular supplement-particularly one that can cause rapid heart rate and other side effects that could hinder an otherwise potentially productive workout.

And no matter what your age, if you have problems with your heart, be sure to consult a physician before taking a pre-workout or any other supplement.

ARE SOME PRE-WORKOUTS BETTER FOR WOMEN?

More women are in the weight room than ever, training harder than ever, and that means more

women than ever are taking supplements, too. We think it's high time this happened! But there are certain supplements, like pre-workouts, where the same rules and dosages that apply to one athlete may not always be the best for another.

Here's why: Research-recommended dosages of caffeine for athletic performance are generally based on body weight. The range that Douglas Kalman, Ph.D., RD, and co-founder of the International Society of Sports Nutrition, gives is 3-6 milligrams per kilogram of body weight, granting that it's highly personal-and that 6 milligrams is a serious dose that isn't appropriate for most people.

For a 55-kilogram (or 120-pound) woman, that's an "I feel it, but not too much" 165 milligrams of caffeine on the low end, or a "My eyes are bugging out of my head" 330 milligrams on the high end. And those are very different than for a 200-pound bodybuilder! Many popular pre-workouts, though, contain a fixed scoop of 300 or more milligrams per serving, regardless of how big you are.

This isn't necessarily a problem, but it's worth taking into consideration before you take a scoop of a random pre-and maybe end up feeling like your heart is beating out of your chest. Several companies on our list of the Best Women's Pre-Workouts make women-specific products with women's body size taken into account in the dosing.

"I always say, start small and then go up from there, just to see how well your body tolerates it," says Krissy Kendall, Ph.D. Translation: Try a half scoop, or even less, of popular pre-workouts to

gauge your tolerance initially, and then customize subsequent doses.

As for the effectiveness of all the individual ingredients in pre-workouts, that doesn't change just because you use one locker room or the other. The increased energy, strength, endurance, and decreased muscle soreness that Jim Stoppani, Ph.D., and others, says help caffeine make workouts better is just as true for women as for men. The same goes for common ingredients like citrulline malate and beta-alanine.

In one recent vote of support, A 2018 study published in the Journal of the International Society of Sports Nutrition confirms the fact that pre-workouts can "improve upper-body muscular endurance and anaerobic capacity [in women], while improving feelings of focus following high-intensity exercises." [8] Sound familiar? Just figure out what dose works for you, and try for yourself.

CAN I TAKE OTHER SUPPLEMENTS IF I TAKE PRE-WORKOUTS?

Yes, of course! Pre-workout supplements are formulated with a specific purpose in mind: to give you extra energy or endurance so you can attack your workout with focus and purpose. Other supplements are formulated to accomplish other, equally specific goals.

For example, if you're not getting enough protein in your diet, all the pre-workouts in the world won't help you see lasting results. Eat up, and if you can't eat enough, have a shake post-workout, or even alongside your pre-workout.

On the flipside, if your pre-workout of choice is a little low in certain ingredients, as many are, it's

OK to soup it up with a little extra. Here are a few to consider:

- **Beta-alanine:** This ingredient needs to be taken nearly daily in order to work effectively, so taking an additional 3 grams outside of your pre-workout is a no-brainer.
- **Creatine:** Similar to beta-alanine, creatine should be taken daily to provide muscular recover and other benefits.
- **Nitric oxide boosters:** Some companies make non-stimulant "pump" blends that can be stacked with a caffeinated pre-workout or energy drink.

If you're taking a caffeinated pre-workout, just be careful not to take other stimulants on top of it. The dose in most pre-workouts is strong enough without any extra caffeine!

SHOULD I BUY OR MAKE MY PRE-WORKOUT SUPPLEMENT?

If you're someone who likes that extra level of control in your nutrition and supplementation, there's no reason you couldn't make your own pre-workout. Well, scratch that, there are a couple of reasons: It can end up being far more expensive, and depending on how you make it, you might miss out on a few key ingredients. And the taste is probably going to be terrible... Yeah,

this is a pretty tall order for the average gym-goer.

So, before you put on a lab coat and go deep into PubMed, make sure you have a rock-solid foundation of training and nutrition. Are you training 3-5 times a week consistently, and with good form? Are you eating adequate calories and protein, and having a solid pre-workout meal before intense training sessions? Check, check, check. OK, then maybe you're no longer an "average" gym-goer.

That said, before you start perusing the dark web for a discounted palette of pure African yohimbine, bear in mind that starting simple is almost always the best option. If you're going to make your own pre, keep it to the key ingredients that the best pre-workouts share: caffeine (if that's your thing), beta-alanine, and perhaps nitric oxide boosters for endurance and pumps. If you want to go down the rabbit hole of nootropics (i.e., brain-boosting supplements) or other highly goal-specific ingredients, go for it—but don't expect magic.

Remember, this isn't about cheating the process. It's only about reasonably enhancing what you can get out of it!

Reviewed by: Douglas Kalman, Ph.D., R.D. and Susan Hewlings, Ph.D., R.D.

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