

L-Theanine For Anxiety: An Effective Supplement?

L-Theanine is a non-essential amino acid derived primarily from the plant *Camellia sinensis*. It was discovered as a green tea constituent circa 1950, and can also be found within other types of tea including black tea and white tea. The levorotatory “L” (left-handed) enantiomer is more popular than the dextrorotatory “D” enantiomer and better understood.

As a result, many supplement manufacturers sell “L”-theanine, giving the user solely the L-enantiomer’s effect. There are numerous scientifically documented [benefits of L-theanine](#) including: cognitive enhancement (i.e. nootropic effect) when co-administered with caffeine and action as a [neuroprotective agent](#) (protecting brain cells from damage). Other hypothesized beneficial properties of L-theanine include, (but are not limited to): anticancer properties, antiobesogenic effects, and sleep enhancement.

Of all the benefits derived from L-theanine, perhaps the most prominent is its anxiolytic effect. L-theanine has been used for centuries as a [natural cure for anxiety](#), and is considered far safer than most pharmaceutical anxiolytics. Current-market drugs like [benzodiazepines are linked to dementia](#), tend to promote sedation, and cause memory impairment, whereas L-theanine reduces anxiety without a sedative-hypnotic effect nor decreases in memory.

L-Theanine For Anxiety (Scientific Research)

There is an abundance of scientific research supporting the idea that L-theanine elicits an anxiolytic effect in humans and animal models. While the degree of anxiolytic effect may not be as extensive as certain pharmaceutical drugs, the side effect profile and likelihood of unwanted long-term effects stemming from L-theanine usage is low. In fact, there is some evidence to suggest that L-theanine supplementation over the long-term may promote healthy cortical activity.

2014: A study published in 2014 analyzed the effect of L-theanine among a sample of Sprague-Dawley rats. These rats had been exposed to scenarios that triggered a rat model of PTSD (Post-Traumatic Stress Disorder). Researchers note that approximately 1/5 adults with medical conditions take herbal products, and therefore wanted to conduct an investigation as to whether L-theanine may attenuate symptoms of PTSD.

Individuals with PTSD not only have severe anxiety associated with hyperactivation of the sympathetic nervous system, but they have altered levels of neurotransmitters, brain activation, and possible alterations in genetic activation. For this study, researchers assigned the Sprague-Dawley rats to a “stressed condition” or a “non-stressed condition” designed to provoke anxiety. They then analyzed genetic correlates linked to regions of the brain involved in PTSD, namely the amygdala and hippocampus.

The rats then received either saline (placebo), midazolam (a benzo), L-theanine, or midazolam + L-theanine. Authors noted that 3 genes within the hippocampus and 5 others in the amygdala were significantly different between the groups. This study suggests that in rodent models, L-theanine has the potential to alter genetic expression and ultimately specific neural correlates associated with PTSD.

It is therefore very likely that L-theanine may modulate certain genetic correlates associated with PTSD and anxiety in humans, thus potentially reducing the severity. It is unclear as to whether the genetic-neural modulations would be of clinical significance, but it is worth exploring – particularly for individuals hoping to [overcome PTSD](#).

- Source: <http://www.ncbi.nlm.nih.gov/pubmed/25165739>

2013: A study was published in 2013 that analyzed the effects of L-theanine on humans exposed to stress. In the past, L-theanine had demonstrated significant efficacy for buffering psychosocial stress in animal models. For this study, researchers recruited 20 participants – all of which were 5th year university students (studying pharmacy).

The 20 participants were assigned at random to receive either: L-theanine (400 mg daily) or a placebo (lactose). Those receiving the L-theanine were administered 200 mg twice per day. Administration of the L-theanine (or placebo) occurred for a 10 day period and students were assessed for anxiety with the State-Trait Anxiety Inventory (STAI), and secondary measures included salivary alpha-amylase activity (sAA) to determine sympathetic activation.

Results indicated that sAA markers were significantly higher among those receiving the placebo compared to those taking L-theanine, suggesting greater sympathetic activation. In addition, subjective stress ratings were reduced among those taking L-theanine compared to the placebo. Researchers concluded that L-theanine reduced stress among advanced pharmacy students.

This means that if you are prone to anxiety, L-theanine may be reducing certain biomarkers associated with the stress response (e.g. sAA). Keep in mind that while salivary alpha-amylase activity was the only sympathetic biomarker measured, others may have been favorably altered as well. This study clearly highlights the anti-stress potential of L-theanine.

- Source: <http://www.ncbi.nlm.nih.gov/pubmed/24051231>

2012: Researchers suggested that L-theanine alleviates anxiety by reducing excitatory activation of cortical neurons, possibly via inhibition of L-glutamic acid. A study published in 2012 documented the effect of L-theanine or caffeine on cognitive performance under stress in humans. They recruited a total of 14 participants all of which were assigned to three scenarios: L-theanine + placebo, caffeine + placebo, or an isolated placebo.

The researchers documented that L-theanine decreased scores of “Tension-Anxiety” as evidenced by the Profile of Mood States assessment. Moreover, L-theanine offset hypertensive spikes among stress-prone individuals. This study provides more evidence to support the idea that L-theanine acts as an anxiolytic and can mitigate various (unwanted) physiological alterations (e.g. hypertension) associated with acute stress (or anxiety).

- Source: <http://www.ncbi.nlm.nih.gov/pubmed/23107346>

2012: It has long been noted that when combined with caffeine, L-theanine is capable of reducing neurophysiological stimulation stemming from caffeine. In a study published in 2012, researchers investigated whether L-theanine could reduce [opiate withdrawal symptoms](#) in a group of monkeys suffering from opioid addiction. Specifically, they analyzed a group of rhesus monkeys dependent on morphine.

As an additional investigation, they determined whether L-theanine reduced anxiogenic behaviors in mice. This was assessed using an elevated plus maze and marble burying tasks. Researchers noted that L-theanine significantly reduced [morphine withdrawal symptoms](#) among rhesus monkeys such as: muscle tension, pacing, shaking, masturbation, and fighting. Among the mice, L-theanine significantly reduced anxiety and was noted to have no significant effect on motor activity.

Authors concluded that L-theanine may be beneficial for treating behavioral anxiety as well as various symptoms of opioid withdrawal in humans. There appeared to be no major drawbacks associated with using L-theanine. Due to the fact that many individuals withdrawing from opioids experience debilitating anxiety, perhaps L-theanine supplementation would reduce withdrawal-induced anxiety.

- Source: <http://www.ncbi.nlm.nih.gov/pubmed/22935630>

2011: A study published in 2011 documented the efficacy of L-theanine as an adjunct treatment for schizophrenia when administered with an antipsychotic. This study was mid-size in

that it included 60 participants all of whom were formally diagnosed with schizophrenia or schizoaffective disorder – a related condition. The design was double-blind, placebo-controlled, and randomized – assigning the participants to receive L-theanine (400 mg per day) over a period of 8 weeks.

One of the measures taken in the study was the Hamilton Anxiety Rating Scale (HARS) to determine whether the adjunct of L-theanine elicited an anxiolytic effect. Compared to the placebo group, individuals receiving L-theanine had significantly less anxiety at the end of the 8 week study period. This suggests that among individuals with severe neuropsychiatric disorders like schizophrenia, L-theanine may provide substantial benefit for anxiety reduction when used as an adjunct.

Some may go as far as to classify L-theanine as a [natural remedy for schizophrenia](#), as it appeared to substantially reduce positive symptoms (e.g. hallucinations / delusions) as well. Further research needs to be conducted with L-theanine among those with psychiatric disorders. Due to the significant anxiolytic effect reported in this study, perhaps a future study could investigate its effects among individuals with specific anxiety disorders.

- Source: <http://www.ncbi.nlm.nih.gov/pubmed/21208586>

2009: A study published in 2009 specifically sought to determine the anxiolytic effect of L-theanine in a group of Sprague-Dawley rats. In addition to understanding whether L-theanine could substantially reduce anxiety, researchers wanted to learn whether the amino acid would interact with GABAergic receptors. The study involved 55 rats, each assigned to receive one of the following: saline, L-theanine, flumazenil + L-theanine, midazolam + L-theanine.

Behavior was assessed with an “elevated plus maze” and evaluated based on the quantity of time the rats spent solely in the “open arm” section of the maze compared to time spent in the entire rest of the maze. Researchers noted that L-theanine did not modulate the GABAA receptor to reduce anxiety, but produced synergistic anxiolytic effects when combined with a benzodiazepine (midazolam). These results indicate that L-theanine may not significantly reduce anxiety as a standalone intervention, but when administered with another anxiolytic, it may synergistically enhance efficacy.

- Source: <http://www.ncbi.nlm.nih.gov/pubmed/20108732>

2007: A small-scale trial of L-theanine was published in 2012 to assess its effects on acute psychological and physiological stress. This trial included a total of 12 participants, all of which had gone through 4 trials. The first trial involved L-theanine at the beginning of the experiment, the second taking L-theanine “half-way” through, and two control trials (a placebo or nothing).

Evidence from this study reveals that L-theanine supplementation decreased physiological responses to acute stress, notably heart rate (HR) and salivary immunoglobulin A (s-IgA) compared to a placebo. Researchers suggest that stress-induced physiological alterations in (HR) and (s-IgA) were likely attenuated by L-theanine. In other words, L-theanine altered activation of the sympathetic nervous system.

Authors emphasize the potential anti-stress properties of L-theanine, postulating that it inhibits cortical excitation. While this was a small-scale trial, it provides yet more evidence to suggest that L-theanine may offset sympathetic hyperactivation

associated with stress. It seems to act as a neurophysiological buffer against certain aspects of anxiety and stress.

- Source: <http://www.ncbi.nlm.nih.gov/pubmed/16930802>

2004: A study published in 2004 discussed the fact that L-theanine is historically recognized as a natural relaxant or anxiolytic. This study was interesting in that it compared L-theanine to the highly-potent pharmaceutical drug Xanax (Alprazolam). The study was small-scale, involving 16 participants that were assigned to one of three groups: Xanax (1 mg), L-theanine (200 mg), or placebo.

The participants were then exposed to a “relaxed” condition as well as an “anxiety-inducing” condition. Assessments included in this study included measures of anxiety such as the BAI, STAI, and the VAMS. These measures were administered at baseline (pre-treatment) as well as following the “relaxed” and “anxiety-inducing” conditions.

Results indicated that L-theanine promoted relaxation at baseline on certain aspects of the VAMS. Furthermore, Xanax didn’t produce substantial reduction in anxiety compared to the placebo during the “relaxed” condition. This research suggests that when exposed to acute anxiety, neither L-theanine nor Xanax significantly reduced anxiety.

It should be suggested that since this study was extremely small-scale, results may lack accuracy. That said, there was evidence that L-theanine increased relaxation at baseline, indicating that when administered a resting state, it could enhance relaxation. It

could be hypothesized that L-theanine may serve as a safer [Xanax alternative](#) for those seeking enhanced relaxation.

- Source: <http://www.ncbi.nlm.nih.gov/pubmed/15378679>

L-Theanine for Anxiety: How It Works as a Natural Anxiolytic (Mechanisms of Action)

The mechanism of action associated with L-theanine is fairly complex. When ingested, it crosses the blood-brain barrier, affecting neuroelectrical activity, neurotransmission, and physiological functions. From a structural perspective, L-theanine resembles glutamate, a neurotransmitter that promotes cortical excitation. Due to its structural resemblance, L-theanine is capable of binding to some glutamate receptors, primarily AMPA receptors and kainate receptors.

At these receptor sites, L-theanine functions as an antagonist, yet at the NMDA receptor site (to which it has a minor affinity), it functions as a agonist; thereby balancing cortical excitement. It is believed to affect the release of glutamate as a result of its binding at the metabotropic glutamate receptors, modulating voltage-dependent calcium channels – possibly reducing anxiety. Further, it seems to modulate synaptic strength and connectivity, which may promote anxiolytic effects.

L-theanine seems to elicit inhibitory action on transporters of glutamate and glutamine, which allows for increases in extracellular levels of these neurotransmitters. Other

neurotransmitters altered upon ingestion of L-theanine include: GABA, dopamine, serotonin, and glycine. Enhanced production of neurotrophins ([BDNF](#) and NGF) have been noted with administration of L-theanine, as well as increased [alpha brain waves](#) – all of which may result in anxiolysis.

- Source: <https://www.ncbi.nlm.nih.gov/pubmed/17182482>
- Source: <https://www.ncbi.nlm.nih.gov/pubmed/21477654>
- Source: <https://www.ncbi.nlm.nih.gov/pubmed/21861094>
- Source: <https://www.ncbi.nlm.nih.gov/pubmed/9566605>
- Source: <https://www.ncbi.nlm.nih.gov/pubmed/17272967>

[Brain waves](#): Altering neuroelectrical activity is known to significantly reduce levels of anxiety. As an example, some people have success using EEG [neurofeedback for anxiety](#) in which they uptrain (increase) alpha waves and downtrain (decrease) [beta waves](#). Various studies analyzing the neuroelectrical effects of L-theanine administration have documented increases in alpha brain waves in specific regions.

Alpha brain waves are associated with calm, relaxed, creative states. Other studies have found that L-theanine may not enhance alpha activity, but may promote calm, focused states possibly characterized by certain beta waves. There is reasonable evidence to postulate that part of the anxiolytic mechanism of L-theanine is via alteration of brain waves.

[Cortical excitation \(stabilization\)](#): Increased cortical excitation is associated with excitatory and stimulatory neurotransmitters, brain waves, and other hormones. It appears as though L-theanine modulates excess cortical excitation associated with anxiety and stress. L-theanine may stabilize brain

activity and/or enhance homeostatic relaxation via neurotransmitter modulation; particularly glutamate.

Genetic modulation: A study conducted in rats demonstrated that L-theanine produced changes in genetic correlates of brain regions. While the changes were relatively vague, the rat study cited 3 changes of genetic correlates associated with the hippocampus, and 5 changes of genetic correlates associated with the amygdala. While further investigation is necessary to elucidate these genetic alterations, perhaps supplementation alters certain genes to alleviate anxiety.

Neurotransmission: L-theanine affects a variety of neurotransmitters including: dopamine, GABA, glutamate, norepinephrine, and serotonin. While the precise alterations to levels of these neurotransmitters remains unclear, most effects are thought to be favorable and/or neuroprotective. Specific alterations may hold more weight in regards to anxiety reduction compared to others, or certain alterations may be more beneficial for specific types of anxiety compared to others.

- Dopamine: To a certain extent, L-theanine may [increase dopamine levels](#). It doesn't substantially increase dopamine to the extent of Adderall or other cognitive enhancers, but it may produce enough to help reduce addiction, dependence, and/or drug withdrawal.
- GABA: It is thought that L-theanine may affect GABA (gamma-amino-butyric-acid) activity. Studies conducted in animals demonstrated L-theanine's ability to increase GABA synthesis, and it is suspected that L-theanine enhances GABA production in humans.
- Glutamate: When glutamate levels become high, a state of neural excitement known as "excitotoxicity" may ensue. Too

much glutamate activity is capable of [killing brain cells](#) and damaging brain health. Due to L-theanine's structural similarity to glutamate, it binds to glutamate receptors, modulating its activity and preventing excitotoxicity.

- **Norepinephrine**: Research suggests that L-theanine decreases levels of norepinephrine. This may be part of the mechanism by which it attenuates activation of the sympathetic nervous system when exposed to an acute stressor. Moreover, it appears as though a decrease in norepinephrine prevents anxiety-induced hypertension.
- **Serotonin**: Some evidence suggests that L-theanine may [increase serotonin](#) production in specific regions, while contradictory findings suggest an overall decrease. One publication noted that while tryptophan (5-HT precursor) levels increased, cortical levels of serotonin (5-HT) decreased, leading to low serotonin. A reduction in serotonin may be beneficial for those with social anxiety, a condition that may be [caused by too much serotonin](#).

Regional activation: It should be speculated that L-theanine may alter regional activation within the brain. It is already documented that neuroelectrical activity is altered throughout the brain upon administration of L-theanine, but it isn't known as to whether there are any changes in cortical blood flow, or activation within specific regions. Certain regions may decrease in activity, while others increase in activity to produce an anxiolytic response.

Sympathetic nervous system: The sympathetic nervous system is associated with anxiety and stress. Heightened anxiety and stress often stem from unconscious responses to external stimuli, activating the sympathetic nervous system. It is the sympathetic nervous system that triggers the "fight-or-flight" response, helping you escape from a predator (e.g. a lion) and increasing the chances of your survival.

Evolution has fine-tuned this fight-or-flight response, but in certain individuals with anxiety, it becomes overactive. L-theanine appears to prevent excess sympathetic activation when faced with acute, non-threatening stress (e.g. a math test). It accomplishes this by inhibiting specific sympathetic biomarkers (such as salivary alpha-amylase activity / salivary immunoglobulin A) and neurotransmitters (such as norepinephrine).

Synaptic modulation: L-theanine is known to modulate activity in AMPA, kainate, and NMDA receptors. All of these receptors are associated with modulation of synaptic plasticity. Perhaps part of the mechanism by which L-theanine contributes to anxiety reduction is via modulation of synaptic strength and connectivity between certain regions.

Advantages of Using L-Theanine for Anxiety

There are several major advantages associated with using L-theanine for anxiety over other treatments. While there are plenty of effective ways to deal with anxiety, there are also many pharmaceutical anxiolytic treatments that yield deleterious long-term results. For example, benzodiazepines are potent anxiolytics, but should be considered [dangerous psychiatric drugs](#) due to addiction potential and long-term effects.

Affordable: For 120 capsules of L-theanine (200 mg), it costs roughly \$26 dollars; some places will even sell it for cheaper. It is relatively cheap to take L-theanine as a supplement assuming it's helping with your anxiety. Most pharmaceutical drugs on the market cost substantially more than \$0.22 per pill.

Cognitive enhancement: Individuals with poor cognitive function may struggle with anxiety for fact that their brain cannot comprehend material, process information, or may seem “slow” compared to others. Enhancement of cognition can be achieved when L-theanine is administered with caffeine. While caffeine may provoke anxiety, L-theanine appears to offset caffeine’s anxiogenic effect. The 2:1 ratio of L-theanine to caffeine can provide relaxation, a [nootropic](#) effect, and potentially an [increase in IQ](#).

Fast-acting: Another favorable aspect of taking L-theanine is that the effects are noticeable immediately. Some doctors prescribe [SSRIs](#) for anxiety, which can take awhile to alter your neurochemistry enough to yield an anxiolytic response; sometimes this takes 4 to 6 weeks. L-theanine produces a noticeable effect within minutes rather than weeks, thus providing immediate anxiety relief.

High doses: Most people can tolerate high doses of L-theanine without any negative reactions or side effects. The recommended daily dosing is between 200 mg and 1200 mg, but even when taken at supratherapeutic levels, adverse reactions are unlikely. In addition the drug doesn’t seem to produce a sedative hypnotic effect and ultimately should not impair motor performance or cognitive function.

Long-term effects: While long-term effects are not well-documented, most research suggests that L-theanine is likely safe over a long-term. Although the substance may lose some efficacy over time if used frequently on a daily basis, no deleterious long-term effects have been documented. In fact, some reports suggest that long-term usage may be beneficial for brain and physical health.

Miscellaneous health benefits: Preliminary evidence suggests that using L-theanine for anxiety may result in other favorable health benefits. L-theanine has been suggested to have anticancer properties, thus preventing cancer and growth of tumors. In addition, it may aid in weight loss efforts and prevent obesity as an antiobesogenic. Furthermore, a study in *Caenorhabditis elegans* revealed that it extends life expectancy.

Neuroelectrical stabilization: L-theanine may correct faulty brain wave activity in certain regions. Some studies have showed increased alpha waves following administration, others suggested altered neuroelectrical activity characterized by improved attention, while other evidence suggests decreased electrical activity of all frequencies. This supplement may stabilize and/or elicit beneficial alterations to certain brain waves.

Neuroprotective effects: L-theanine supplementation seems to protect the brain from cellular damage. In studies conducted on rodents, administration of L-theanine within 12 hours following an ischemic attack resulted in significantly better tissue recovery and less damage. While studies haven't analyzed L-theanine's effect on stroke rehabilitation in humans, it could be suggested to demonstrate similar effects.

It is known to protect the brain from excitotoxicity associated with excess glutamate. High levels of glutamate are known to damage certain regions of the brain and result in neuronal death. Supplementation with L-theanine may help you preserve cortical tissue as well as neurons within the brain.

Side effect profile: Most [L-theanine side effects](#) are not considered clinically significant. Individuals that experience side

effects from supplementation are likely to be taking high doses and/or combining it with another drug or supplement. Common side effects associated with L-theanine include: dizziness, headaches, and stomach aches; a majority of individuals won't experience anything noticeable.

Sleep enhancement: It is common knowledge that anxiety can be exacerbated by poor sleep. L-theanine appears to increase slow wave sleep and may even work as a natural sleep aid in certain individuals. Several reports document L-theanine's ability to increase both sleep quality and sleep efficiency among those with normal mental health, as well as among individuals diagnosed with ADHD and schizophrenia.

Synergistic effects: When combined with an anxiolytic drug, L-theanine appears to act synergistically, increasing the efficacy of the drug. In addition, L-theanine appears to offset the effects of stimulatory agents, while simultaneously enhancing cognitive function. If your goal is to decrease anxiety and you're taking another drug and/or supplement, L-theanine may enhance the therapeutic effect.

Are there any significant drawbacks associated with using L-theanine?

There don't appear to be any significant drawbacks associated with using L-theanine for anxiety. Some individuals may find that it doesn't work as well as they had hoped, while others may discover that L-theanine decreases anxiety, but increases [brain fog](#). Should anyone experience brain fog from L-theanine, this can usually be offset via administration of a stimulatory substance such as caffeine.

The side effect profile is favorable (with no clinically recognized side effects). In addition, the research suggests that L-theanine is likely to be effective. None of the studies found L-theanine ineffective for the treatment of anxiety and/or stress. The only major drawback is that L-theanine may not provide a long-lasting anxiety relief with an effect lasting several hours.

This may mean that you need to take multiple doses throughout the day. Some individuals have reported that L-theanine can “stop working” over time, possibly due to neurophysiological tolerance to its effects. It may interact with various drugs (pharmaceutical and illicit) as well as other supplements, so users should discuss potential contraindications with a medical professional before using.

Have you tried using L-theanine for anxiety?

If you've tested L-theanine as an intervention for anxiety, feel free to leave a comment below. Mention the type of anxiety you were dealing with (e.g. social anxiety), and how well it worked on a scale of 1 to 10. To help others with anxiety better understand your situation, document the daily dosage you used, specific brand of L-theanine, and whether you were using it as a standalone treatment and/or with other substances (drugs and/or supplements).

Perhaps in forthcoming years a pharmaceutical (or biotech company) will develop a more potent derivative of L-theanine as a [new anxiety medication](#); many derivatives have been patented for a variety of health conditions. These derivatives could elicit more potent anxiolytic effects than L-theanine, yet maintain safety and tolerability. Realize that L-theanine isn't going to work for

everyone's anxiety; efficacy is subject to significant individual variation.

L-theanine is a supplement that the literature indicates will help with anxiety, but the extent of anxiolytic relief is unknown and warrants further research. In most cases, it is worth testing due to the fact that it is a safe and well-tolerated supplement.