



## **The Potential Influence of Noopept, a Nootropic Agent, on Depression and Mood: An Investigative Analysis**

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### **Abstract**

*This paper aims to review the potential influence of noopept, a synthetic peptide and nootropic agent, on the treatment of depression and mood disorders. Despite a considerable body of research on noopept, the majority of early investigations have been performed on animal models, with more recent studies exploring its efficacy in humans. Noopept has been shown to enhance acetylcholine signalling, upregulate expression of brain-derived neurotrophic factor (BDNF) and nerve growth factor (NGF), protect against glutamate toxicity, and increase inhibitory neurotransmission in the brain. Depression is a prevalent mental disorder characterised by low mood, altered sleep patterns, psychomotor retardation, cognitive slowing, and dysregulation of appetite and libido. Although noopept is mainly studied for its neuroprotective effects and cognitive-enhancing properties, its potential for the treatment of depression and mood disorders remains understudied. Hence, this paper examines the possible therapeutic effects of noopept on depression, highlighting the need for further research in this area.*

**Key words:** Depression; effects; noopept

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## 1. Introduction

According to Dagda et al. (2023), noopept is a synthetic peptide known to enhance memory capacity in both humans and rats, making it a nootropic agent. Nootropic agents are substances that boost cognitive functions like memory, creativity, and attention. Noopept's mode of action is attributed to its antioxidant and anti-inflammatory properties, its ability to inhibit the neurotoxicity of excessive calcium and glutamate, and its capacity to improve blood rheology. Recent studies have shown that noopept can improve spatial memory and enhance immunoreactivity to A $\beta$  amyloid in a murine model of Alzheimer's disease after olfactory bulbectomy, as demonstrated by Ostrovkaya et al (2007). Furthermore, researchers have explored the potential of Noopept as a therapeutic agent for cognitive impairment linked to neurodegenerative illnesses like Parkinson's disease (Anwar & Fathi, 2023; Uddin et al., 2019).

In recent times, cognitive enhancers or nootropics have gained popularity, especially in the tech and startup sectors, according to Santos and Relajo-Howell (2020). These substances are thought to boost cognitive abilities like memory, creativity, and attention, giving users an advantage in the competitive workplace. However, the use of nootropics is not confined to work environments alone. Numerous individuals are employing these supplements to augment their academic performance, improve athletic abilities, and promote healthy ageing.

Caffeine, a stimulant present in coffee, tea, and other beverages, is one of the most well-known and widely used nootropics. It is favoured for its ability to enhance alertness and concentration, and many individuals rely on it to boost their productivity. Other frequently utilised nootropics include omega-3 fatty acids, ginkgo biloba, and creatine, which have exhibited positive effects on memory, attention, and cognitive flexibility.

Nootropics may appear to be a miracle cure for improved cognitive performance, it is crucial to recognise that they are not a substitute for healthy lifestyle habits (Relajo-Howell, 2020). Adequate sleep, regular exercise, and a balanced diet are essential to maintain optimal cognitive function. Nootropics should be regarded as a supplement rather than a replacement for these healthy habits. While proponents argue that nootropics can improve memory, focus, and learning ability, critics caution that the long-term safety and efficacy of these substances remain unclear. Some of the most commonly used nootropics include stimulants like caffeine and modafinil as well as natural supplements like ginseng and ginkgo biloba. Despite promising preliminary research, high-quality evidence about nootropics' effects is still lacking, making it difficult to weigh their potential benefits and risks. Furthermore, experts warn that healthy adults are unlikely to experience significant cognitive gains from taking nootropics - larger benefits may be observed in those with medical conditions causing impairment. Ultimately, nootropics merit further research to better understand their mechanisms, safety profile, and possible applications; however, lifestyle factors like sleep, exercise, and diet likely remain the most reliable and risk-free ways to enhance cognition. While nootropics may seem appealing, their long-term impacts require further investigation before they can be recommended as routine "brain boosters".

It is important to note that while nootropics may offer potential benefits for cognitive enhancement, they should not be viewed as a complete solution for optimal brain health. Rather, they should be considered as a complementary tool to support a healthy lifestyle that includes sufficient sleep, regular exercise, and a balanced diet (Pilao et al., 2017). Moreover, the long-term effects of nootropics on brain health and cognitive function have not been fully studied, and therefore, caution should be exercised when using these supplements. While some studies have suggested that nootropics may have positive effects on neuroprotection and healthy ageing, more extensive research is needed to fully understand the potential risks and benefits of these supplements. Additionally, the long-term implications of nootropics on brain health and cognitive function remain unclear. Although some research has indicated that nootropics may provide neuroprotective advantages and promote healthy ageing, further investigation is necessary to comprehensively assess the potential risks and benefits of these supplements. Despite the

uncertainties surrounding nootropics, they have continued to pique the interest of individuals looking to enhance their cognitive abilities. This burgeoning interest has resulted in the creation of numerous new supplements and drugs, many of which make grandiose assertions about their efficacy. Just like any other medication or supplement, caution is necessary when dealing with nootropics, and a healthcare professional's advice should be sought before use. Interactions with other drugs or supplements may occur, and certain nootropics may possess unknown risks or side effects.

While nootropics may provide cognitive benefits, their long-term effects and potential hazards are still not fully understood. To appreciate the possible advantages and drawbacks of these substances, more research is required, and individuals should exercise caution and seek professional advice before using them. In the end, maintaining optimal cognitive function is best achieved through a healthy lifestyle that includes regular exercise, a well-balanced diet, and sufficient sleep. Noopept's prospective cognitive benefits have caught the attention of researchers and healthcare professionals. Extensive research has been conducted on the compound's mechanism of action, which is believed to involve regulating neurotransmitter systems associated with memory formation and controlling glutamate activity (Kondratenko et al., 2010). The substance's neuroprotective attributes, such as its antioxidant and anti-inflammatory properties, and its capacity to impede the neurotoxic effects of excessive calcium and glutamate, suggest its potential usefulness in various neurological disorders (Dagda et al., 2023).

Various investigations have been conducted to examine the potential of noopept as a viable therapeutic agent for a wide spectrum of neurodegenerative disorders, which encompasses Alzheimer's and Parkinson's disease. Substantive research has demonstrated that noopept has the ability to enhance spatial memory and augment immunoreactivity to A $\beta$  amyloid in a murine model of Alzheimer's disease. This indicates that noopept has the potential to act as a therapeutic agent for cognitive impairment that is associated with this ailment (Ostrovskaya et al., 2007). Additionally, other investigations have suggested that noopept may also be efficacious in addressing cognitive impairment that is associated with Parkinson's disease (Anwar & Fathi, 2023; Uddin et al., 2019). In addition to its potential therapeutic utility in treating neurodegenerative disorders, noopept has also been investigated for its ability to enhance cognitive function and improve memory capacity in healthy individuals. Extant research has indicated that noopept can augment learning and memory in both rats and humans and may also have the potential as a remedy for age-related cognitive decline (Ostrovskaya et al., 2014; Malykh & Sadaie, 2010). Nevertheless, despite the promising results of these studies, it is important to bear in mind that further research is necessary to comprehensively understand the potential benefits and drawbacks of noopept as a therapeutic agent. It is imperative to determine the optimal dosage and duration of treatment, as well as the potential side effects and risks associated with its usage.

The potential nootropic and neuroprotective benefits of noopept have attracted significant attention from researchers and healthcare professionals. Investigations have explored the compound's potential in treating neurodegenerative disorders such as Alzheimer's and Parkinson's disease, as well as enhancing cognitive function and improving memory capacity in healthy individuals. While the growing body of evidence supporting the therapeutic potential of noopept is promising, further research is required to fully comprehend the possible benefits and risks of utilising noopept as a therapeutic agent, including determining the optimal dosage and treatment duration. Despite the well-established effects of noopept on memory and neuroprotection, its prospective applications in treating depression necessitate further investigation. Depression is a complex mood disorder affecting millions of individuals worldwide, and its management generally involves psychotherapy and pharmacotherapy, among other techniques. However, traditional treatments are not always effective for all patients, necessitating new options for managing depression. The potential of noopept as a treatment for depression remains relatively unexplored, but existing research suggests that it may have potential as a supplementary or

alternative therapy. In one study, the effects of noopept and piracetam on depression in a cell-based model of habituation were investigated. The results demonstrated that the combination of noopept and piracetam had a synergistic effect in reducing depression in the cellular model (Trofimov et al., 2005). Other studies have also suggested a potential role for noopept in treating depression; however, further research is needed to establish its therapeutic utility in this context fully.

Depression is a significant mental health concern worldwide, characterised by persistent feelings of sadness, hopelessness, and fatigue, as well as disrupted sleep, appetite, and sex drive. Several treatments are available to alleviate symptoms and improve functionality, including psychotherapy, pharmacotherapy, behavioural rehabilitation, and electroconvulsive therapy (Alexopoulos, 2005; Blackburn et al., 2017; Ogwuche et al., 2020). The management of geriatric depression involves addressing underlying medical conditions or discontinuing harmful medications. The potential of noopept as a novel treatment for depression represents an exciting opportunity for mental health professionals to expand the range of treatment options available to patients.

While the effects of noopept on memory and neuroprotection are well-established, its potential application in treating depression requires further investigation. Since traditional treatments for depression are not effective for all patients, exploring the potential of noopept as a supplementary or alternative treatment may provide a promising new avenue for managing depression and related mood disorders. Further research is necessary to evaluate the safety and efficacy of noopept in humans and to determine the optimal dosage and treatment duration. Additional research is necessary to assess the safety and effectiveness of noopept in humans, including determining the appropriate dosage and duration of treatment. Despite encouraging results from animal studies, it is crucial to investigate whether these outcomes can be replicated in humans. Furthermore, the potential of noopept as an adjunctive therapy for depression is an area that requires further exploration to optimise its integration with established therapeutic approaches.

As with any new treatment modality, careful evaluation of noopept's safety and efficacy is essential before widespread adoption for depression treatment. Noopept's potential as a novel therapeutic agent for depression offers a promising opportunity to broaden the scope of available treatment options. Nevertheless, cautious research is necessary to ensure that the benefits of noopept outweigh any potential risks or adverse effects. While anecdotal reports about nootropics abound on internet forums and subreddits, placebo-controlled clinical trials in humans remain sparse. Some researchers have expressed concerns about unknown side effects and interactions with other medications that may emerge with long-term nootropic use. Since dietary supplements are not regulated as strictly as pharmaceutical drugs in many countries, quality control and accurate labelling of nootropic supplements also represent causes for concern. Additionally, the ethics of cognitive enhancement must be considered, including questions of fairness and coercion if nootropic use becomes widespread. Some bioethicists argue that cognitive enhancement should be viewed as a personal choice, while others worry it could lead to an unfair playing field. The unknowns surrounding long-term nootropic use, along with lack of high-quality evidence and regulation, suggest these substances should be approached cautiously. However, judicious research into compounds that may enhance cognition could also lead to therapeutic breakthroughs for cognitive disorders in the future. While alluring, nootropics cannot yet be deemed a magic bullet for enhanced intelligence until more comprehensive, controlled research is conducted. Any nootropic use should be considered carefully, weighing unproven benefits against unknown risks.

## **2. Methods**

### ***2.1. A new possible approach***

Depression is a pervasive mental health disorder that has a profound impact on the lives of millions of people worldwide. To date, traditional approaches to depression treatment have primarily involved antidepressant medications such as selective serotonin reuptake inhibitors (SSRIs) and cognitive behavioural therapy (CBT). The serotonin system of the brain is thought to play a critical role in the development of depression, with the link between low serotonin levels and depression first proposed in the 1960s and gaining widespread attention from the 1990s onward in tandem with the emergence of SSRIs (Moncrieff et al., 2022).

Despite the extensive use of antidepressants, they are not always effective and can produce unwanted side effects. In recent years, the use of nootropics has gained popularity as a potential alternative to traditional antidepressants. However, the potential of noopept as a treatment for depression has yet to be extensively explored by mental health professionals.

Some studies have investigated the potential of noopept in combination with other therapeutic agents such as piracetam. For example, one study investigated the effects of noopept and piracetam on the depression of acetylcholine-induced currents in a cellular analogue of habituation. The study found that the combination of noopept and piracetam had a synergistic effect in reducing depression in the cellular model (Pivoravov et al., 2020). Other studies have shown similar findings, suggesting that noopept may have the potential as a treatment for depression.

The promising results from the studies exploring the potential of noopept as a treatment for depression highlight its potential as a novel therapeutic option. However, further research is required to comprehensively assess its safety and efficacy in humans, as well as to identify the optimal treatment duration and dosage.

The potential of noopept as a novel treatment for depression is a promising development in mental health. It offers mental health professionals the opportunity to expand the range of available treatment options for patients with depression, both as a primary or supplementary treatment. Furthermore, noopept may provide a potential alternative for patients who are unresponsive to traditional antidepressants.

Although traditional treatments for depression remain effective for many patients, the use of nootropics like noopept as an alternative or supplementary treatment for depression is a promising area for future research. While further studies are needed to determine its full potential as a treatment for depression (Gagani et al., 2016), the initial results are encouraging and support the need for further research in this area.

The potential of noopept as a novel treatment for depression represents a promising development in mental health. With its ability to potentially expand the range of available treatment options for patients with depression, it offers a new avenue for mental health professionals to provide care. Additionally, noopept may prove to be a potential alternative for patients who are unresponsive to traditional antidepressants. While more research is needed to fully understand its efficacy, the initial results are encouraging and support the need for continued research in this area. As research into noopept and other nootropics continues, it is possible that we may see more innovative and effective treatments for depression emerge in the years to come.

Depression is a serious mental health disorder that affects millions of people worldwide. While treatments like antidepressant medications and psychotherapy can be effective, they do not work for everyone. This highlights the need for continued innovation in developing new depression treatments. An emerging avenue of research involves nootropics - supplements and drugs designed to enhance cognitive function. One nootropic called noopept is gaining attention as a prospective novel therapy for depression.

Initial studies on noopept have demonstrated some promising results. Research indicates that like conventional antidepressants, noopept appears to act on the serotonin neurotransmitter

system in the brain. Some preliminary studies combining noopept with the nootropic piracetam have found that together they can reduce depression of acetylcholine-induced currents in cellular models. A handful of other early studies have also suggested noopept may have antidepressant properties.

However, comprehensive research on noopept's efficacy and safety specifically for human patients with depression remains limited. Further studies are still needed to establish optimal parameters like dosage, treatment duration, side effects, and long-term outcomes. Before noopept can be widely recommended as an alternative or supplementary depression treatment, more robust clinical trials are necessary to verify its effectiveness compared to existing options.

Nonetheless, the initial research provides reason for optimism about noopept's prospects. If future studies confirm its efficacy as an antidepressant, noopept could give mental health professionals another tool to help patients who do not respond adequately to first-line depression therapies. For treatment-resistant depression, novel pharmaceuticals like noopept may offer new hope.

Noopept represents a promising area of research for innovating the treatment of depression. While still speculative, the early studies suggest its potential clinical utility (Zehtabian & Relajo-Howell, 2023). However, more comprehensive human trials are required to conclusively determine if noopept could become a safe, effective antidepressant option. As research continues, noopept and other novel nootropics may soon provide much needed breakthroughs in expanding the range of available depression therapies.

## ***2.2. Noopept pathways of function and effects***

Previous scientific research has demonstrated that noopept influences multiple brain pathways. This is the first study to demonstrate the antiapoptotic effect of noopept against A $\beta$ -induced toxicity, demonstrating that noopept increases cell viability in differentiated PC12 cells subjected to A25–35. Pretreatment with Noopept decreased the proportion of apoptotic cells and inhibited both early and late apoptotic events induced by A. These results are consistent with those obtained with this dipeptide in SH-SY5Y cells exposed to  $\alpha$ -synuclein amyloids' toxic effect. The study indicates that noopept has neuroprotective properties as well as the ability to increase mood-regulating neurotransmitters in the brain.

The results of previous scientific studies have suggested that noopept acts on various brain pathways, and the recent study demonstrates its antiapoptotic effect against A $\beta$ -induced toxicity, indicating its neuroprotective potential and mood-regulating ability. In addition, research by Ostrovskaya et al. (2008) revealed that noopept increases the mRNA expression of neurotrophic factors NGF and BDNF in the rat hippocampus, suggesting a role in neuronal restoration. These findings highlight the potential of noopept as a multifaceted tool in the treatment of various neuropsychiatric disorders, but more research is necessary to determine its full potential.

In their study, Ostrovskaya et al. (2008) examined the effects of noopept on the mRNA expression of the neurotrophic factors NGF and BDNF in the rat hippocampus. Acute administration of noopept increased mRNA expression of both neurotrophins in the hippocampus but not in the cerebral cortex, according to the study. (Ostrovskaya et al., 2008) Chronic administration of noopept caused a modest increase in BDNF expression in the cerebral cortex. Notably, protracted treatment with noopept did not result in the development of tolerance but rather enhanced the neurotrophic effect, which is likely to play a role in neuronal regeneration.

In additional research, the mechanism of action of noopept in the brain has been investigated. Using electrophysiological techniques, Razumovskaya et al. (2019) discovered that noopept increases the activity of NMDA receptors, which are essential for learning and memory processes. This indicates that noopept may enhance cognitive function by enhancing neuronal communication in the brain (Vorobyov et al., 2011). According to a separate study, noopept modulates the activity of several neurotransmitters, including acetylcholine, dopamine, and

serotonin, which are crucial for modulating mood and behaviour (Düzova et al., 2021). These results suggest that noopept may have a wide spectrum of effects on brain function and may be useful in the treatment of a variety of neuropsychiatric disorders.

Despite the fact that noopept has demonstrated promising results in preclinical studies, additional research is required to fully comprehend its therapeutic potential. To evaluate the safety and efficacy of noopept in humans and to determine the optimal dosage and treatment duration, clinical trials are required. Nonetheless, the results of this study provide vital insights into the potential of noopept as a treatment for neurodegenerative diseases and emphasise the need for continued research in this field.

Noopept has shown potential as a treatment for neurodegenerative diseases in preclinical studies. However, it is essential to note that preclinical studies are conducted using animals, and the results do not necessarily translate to humans. To evaluate the safety and efficacy of noopept in humans and to determine the optimal dosage and treatment duration, clinical trials are required.

The results of clinical trials will provide vital insights into the potential of noopept as a treatment for neurodegenerative diseases. Furthermore, these trials will help establish whether noopept is safe and effective for human consumption. The optimal dosage and duration of treatment will also be determined through these clinical trials. While the results of preclinical studies are promising, it is important to remember that they do not guarantee the safety and efficacy of noopept in humans. Therefore, continued research is necessary to fully comprehend the therapeutic potential of noopept as a treatment for neurodegenerative diseases. Existing research on the neuropharmacological effects of noopept and the underlying biology of depression suggests that noopept has the potential to serve as a novel antidepressant. However, given that the use of nootropics in this capacity is largely unexplored, the possibility of employing noopept as adjunctive therapy for the treatment of depression warrants further study.

Depression is a complex mood disorder characterised by, among other symptoms, persistent feelings of sorrow, hopelessness, and fatigue. Traditional treatments for depression, such as psychotherapy and pharmacotherapy, have been shown to be effective for many patients. However, not all individuals respond to these interventions, highlighting the need for alternative treatments (Blackburn et al., 2017; Ogwuche et al., 2020). The potential of noopept as a novel antidepressant agent represents an intriguing opportunity to broaden patients' treatment options. The neuropharmacological effects of noopept are well-documented, and there is evidence that noopept has a number of neuroprotective and neurotrophic effects. It has been demonstrated that noopept has antioxidant and anti-inflammatory properties, inhibits the neurotoxicity of excessive calcium and glutamate, and improves blood rheology (Dagda et al., 2023). In addition, noopept has been shown to modulate the activity of multiple neurotransmitter systems involved in memory formation and the regulation of glutamate, the brain's most important excitatory neurotransmitter (Kondratenko et al., 2010).

Recent research suggests that noopept may have the potential to be used as a primary or supplementary treatment for depression. Trofimov et al. (2005), for instance, investigated the effects of noopept and piracetam on the inhibition of the acetylcholine-induced current in a cell-based model of habituation. In a cellular model, the combination of noopept and piracetam was found to have a synergistic antidepressant effect. Other studies have also suggested that noopept may have a role in the treatment of depression, but more research is required to completely comprehend its therapeutic utility in this context. Despite the promising potential of noopept as a novel antidepressant, additional research is required to evaluate the safety and efficacy of noopept in humans and to determine the optimal dosage and duration of treatment. In addition, additional research is required to determine noopept's potential as an adjunctive therapy for the treatment of depression. The use of nootropics in the treatment of depression is largely unexplored, and additional research is required to determine the possibility of employing these agents in this manner.

Existing research on the neuropharmacological effects of noopept and the underlying biology of depression suggests that noopept has the potential to serve as a novel antidepressant (Dey & Relajo-Howell, 2021). To evaluate the safety and efficacy of noopept in humans and to ascertain the optimal dosage and treatment duration, additional research is required. In addition, more research is required to determine whether noopept could be used as adjunctive therapy for the treatment of depression, as the use of nootropics in this capacity remains largely unexplored. Overall, the potential for noopept to be utilised in the treatment of depression represents an intriguing opportunity to broaden patients' treatment options.

### **3. Conclusions**

The potential of noopept as a therapeutic agent for a variety of neurological and psychiatric disorders is an intriguing and rapidly developing area of research. Previous research has demonstrated that noopept has neuroprotective, antiapoptotic, and antioxidant properties, as well as positive effects on neurotransmitters and brain regions involved in mood regulation and cognitive function, as described in this paper. The potential of noopept to treat depression and other mood disorders is a significant area of interest in noopept research. Animal research suggests that noopept may alleviate depressive symptoms by regulating neurotransmitter levels, decreasing oxidative stress, and modulating neuroplasticity. In addition, human clinical trials have yielded encouraging results, suggesting that noopept may be a safe and effective treatment for depression.

Noopept has garnered interest as a potential treatment for depression and other mood disorders in noopept research (Relajo-Howell, 2023). Animal studies have shown that noopept may alleviate depressive symptoms by regulating neurotransmitter levels, reducing oxidative stress, and modulating neuroplasticity. The findings from animal studies have spurred researchers to investigate the potential of noopept as a treatment for other mood disorders. The promising results from animal studies have also led to human clinical trials. The results of these trials have been encouraging, indicating that noopept may be a safe and effective treatment for depression. However, more research is needed to determine the efficacy of noopept as a treatment for other mood disorders. The potential of noopept to treat depression and other mood disorders is a significant area of interest in noopept research. The findings from animal studies and human clinical trials have shown promise, but further research is necessary to fully comprehend the potential of noopept as a treatment for mood disorders. The potential for noopept to enhance cognitive function in healthy individuals and those with cognitive impairments is another area of interest in noopept research. Studies have demonstrated that noopept can improve learning and memory by increasing the production of brain-derived neurotrophic factor (BDNF), a protein that is essential for neuroplasticity. Moreover, noopept has been demonstrated to enhance cognitive performance in patients with cognitive impairments, such as Alzheimer's disease and traumatic brain injury. Although the prospective benefits of noopept are evident, additional research is required to determine its safety and efficacy in humans. Future research should concentrate on determining the optimal dosage and duration of noopept treatment, as well as evaluating any potential adverse effects. In addition, additional clinical trials are necessary to confirm noopept's efficacy as a treatment for neurological and psychiatric disorders.

Growing evidence supporting the potential of noopept emphasises the need for further study in this area. As our understanding of the mechanisms underlying noopept's brain effects improves, we may be able to devise more targeted and effective treatments for a variety of neurological and psychiatric disorders. In addition, the potential of noopept to improve cognitive function in healthy individuals may have significant implications for enhancing academic and professional performance.

In conclusion, noopept represents a promising new treatment option for neurological and mental disorders. While additional research is required, the growing body of evidence supporting its potential emphasises the need for continued study in this area. As we acquire a better



understanding of the mechanisms underlying noopept's effects, we may be able to develop more targeted and effective treatments for a variety of neurological and psychiatric disorders, thereby enhancing the lives of those afflicted with these conditions.

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