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Oral Nutritional Dietary Supplement Containing GABA and Asparagus Powder Improves Sleep

Yang Cong [1, 2, 3], Huimin Xu [1, 2, 3]

[1] Shanghai Le Bonta Wellness Co., Ltd; Shanghai, China
[2] Jiangsu Hua Sun Health Technology Co., Ltd; Taicang, Jiangsu China
[3] Standard Investment (China) Co., Ltd, Taicang, Jiangsu, China

Abstract: This paper focuses on the effects of two food materials, γ-aminobutyric acid (GABA) produced by natural fermentation and asparagus powder, on the improvement of sleep-in humans. The trial totaled 54 people, divided into three groups: intervention group A (active ingredient GABA 120mg, asparagus powder 1500mg), intervention group B (active ingredient GABA 120mg) and control group (without active ingredient) to carry out the sleep test, and the sleep effect was detected by Pittsburgh Sleep Quality Index (PSQI) and Huawei Sports Bracelet, respectively. The test results show: 1) From the subjective sleep score (PSQI sleep score): sleep quality improvement level intervention group A (28%) > intervention group B (26%) > control group (19%); the effective proportion of sleep aid people in intervention group A (83%)>Intervention Group B (75%)>Control Group (71%);2) The Huawei Sports Sleep Bracelet test showed that the deep sleep continuity of intervention group A improved by 7% after taking the product for one week, and 67% of the subjects improved the deep sleep continuity to varying degrees after taking the product for one week. Significantly higher than intervention group B and control group. Further analysis found that GABA and asparagus powder had a better effect on people with a deep sleep score of ≤70 points. Intervention group A underwent intervention for 1 week, and its total sleep score improved significantly, and there was a significant difference. This result indicates that nutritional dietary supplements can be helpful in improving overall sleep quality. Summary: GABA can help people fall asleep quickly, asparagus powder can induce deep sleep, and their simultaneous intake are complementary. The results of this study show that taking a nutritional dietary supplement of 120 mg of GABA and 1500 mg of asparagus powder every day can significantly improve the quality of deep sleep. Since GABA and asparagus powder are both raw materials in food and have been ingested for a long time, taking nutritional dietary supplements containing both of their ingredients is considered safe and suitable for daily intake, which can effectively improve the quality of deep sleep, thereby improving Overall level of sleep.

Keywords: γ-aminobutyric Acid; Asparagus Powder; Nutritional Dietary Supplements; Sleep.

1. Introduction

The "2021 White Paper on Exercise and Sleep" released by the China Sleep Research Society shows that more than 300 million people in my country have sleep disorders. Experts from the Sleep Research Society believe that long-term lack of sleep can lead to reduced human immunity and induce other diseases. Studies have shown that middle-aged people who sleep less than 7 hours a night have a 26% increased risk of premature death. Sleep disorders are a very common disease that not only disrupts normal circadian rhythms, but also has a negative impact on mental health and physical health [1]. Sleep disorders are not only associated with decreased quality of life and work efficiency, but also with increased physical and mental problems [2]. It is considered a risk factor for many diseases, including cardiovascular events [3, 4], hypertension [5, 6] and type 2 diabetes [7].

Data from the "Healthy China Action (2019-2030)" report released in 2019 showed that the prevalence of insomnia in China in 2016 was 15%, which means that 207 million people suffered from insomnia that year, and the number of insomniacs is increasing year by year. The main characteristics of insomnia are difficulty falling asleep, difficulty maintaining sleep, or waking up earlier than the expected time, and there may be daytime symptoms such as fatigue and decreased concentration. It will seriously affect the patient's quality of life, mental health, work efficiency, increase the patient's medical expenses, and bring a heavy burden to individuals, the health care system, and society.

Currently, commonly used drugs for insomnia include benzodiazepine receptor agonists. However, while these drugs prolong sleep time, they may cause side effects of varying degrees, such as dizziness, fatigue, drowsiness, inattention, anxiety, fear, irritability, hallucinations, and even temporary amnesia and hangovers. They do not really achieve the expected effect of improving sleep quality. Therefore, choosing natural and efficient sedative and hypnotic dietary supplements is an important way to treat sleep disorders.

γ-aminobutyric acid (GABA) is a biologically active amino acid known for its analgesic, anxiolytic and hypotensive activities. It is well known that it is a major inhibitory transmitter compound in vertebrates and is present in high concentrations in the central nervous system [8][9]. It is a natural sedative and anxiolytic component that can adjust a variety of metabolic disorders and is used to regulate the life activities of organisms. It has a calming and soothing effect and plays an irreplaceable role. Therefore, many studies have been conducted on GABA [10]. In particular, many studies have shown that GABA relieves mild mental stress symptoms and insomnia symptoms [11]. Daily GABA production is produced by the decarboxylation of L-glutamic acid catalyzed by glutamate decarboxylase, and foods fermented by lactic acid bacteria or yeast usually contain increased GABA levels. GABA is widely present in many foods in nature, such as tea, brown rice, fish, etc. Studies have shown that GABA levels increase with changes in both biological and non-biological

levels, such as drought, soaking and germination [12]. Among the many types of Chinese tea, white tea has the highest content [13].

Asparagus, commonly known as Asparagus officinalis and Asparagus corytatum, is a dioecious perennial herbaceous plant belonging to the genus Asparagus of the Liliaceae family[14]. Asparagus has high nutritional value. Modern research shows that asparagus is rich in the variety and content of nutrients. Asparagus contains 18 kinds of amino acids and a variety of trace elements, especially selenium, which is higher than that of ordinary vegetables[15]. It also contains flavonoids such as rutin, citron, quercetin, kaempferol, and a variety of saponin compounds [16]. In recent years, the effect of asparagus powder on sleep has attracted the attention of scholars at home and abroad. For example, Zhong Huiqiu[17] and others conducted research on the effect of instant asparagus powder on human sleep, and Ma Shufeng et al.[18] studied the effect of instant asparagus powder with different saponin mass fractions on improving sleep.

Therefore, this article focuses on two materials of functional foods, γ-aminobutyric acid (GABA) and asparagus powder, and observes the effect of instant asparagus powder on human sleep through volunteer tasting experiments, in order to explore the function of the two product combinations in improving sleep disorders, thereby providing a scientific basis for the development of new sleep nutrition dietary supplements.

2. Materials and Methods:

2.1. Experimental Population

1) Experimental population: The selection of subjects was based on the Pittsburgh Sleep Quality Index (PSQI) questionnaire [19]. 54 people with PSQI scores ≥ 6 were selected from the volunteers recruited for this study, because people with PSQI scores ≥ 6 are usually defined as poor sleep [20].

2.2. Experimental Materials

Test materials: Daily Win GABA nutritional dietary supplement (containing 120mg GABA and 1500mg asparagus powder, provided by Shanghai Le Bonta Wellness Co., Ltd.), GABA (containing 120mg GABA) and maltodextrin. Subjective indicators: PSQI questionnaire. Objective indicators: Huawei Sports Band 7.

2.3. Experimental Methods

Intervention group A: products with active ingredients GABA 120mg and asparagus powder 1500mg; intervention group B: products with active ingredients GABA 120mg; control group: products without any functional ingredients and using the same dose of maltodextrin. A randomized, controlled, parallel intervention trial was conducted for 2 weeks, using subjective indicators (PSQI) and objective indicators (Huawei sports bracelet data) to detect sleep outcomes, so as to observe the improvement of sleep in people with sleep disorders by taking daily Wansheng γ-aminobutyric acid product nutritional dietary supplements.

3. Results and Analysis:

3.1. Distribution of Population in Each Group and Description of Basic Conditions

As can be seen from Table 1, the average score of intervention group A was 9.22±2.53, the average score of intervention group B was 8.50±2.71, and the average score of the control group was 8.53±2.07. There was no statistical difference among the three groups, indicating that there was no significant difference in the subjective sleep quality of the three groups of subjects, and the groups were balanced and comparable.

Table 1. Sleep outcome indicators of subjects at baseline

Statistical analysis of PSQI score results	
Group	Rating (average)
Intervention group A	9.22±2.53
Intervention group B	8.50±2.71
Control group	8.53±2.07

3.2. Subjective Sleep Quality Evaluation of Each Group of People

After four weeks of intervention, the PSQI results showed that the PSQI results of the three groups of people were improved to a certain extent, and the improvement level of sleep quality was intervention group A (28%) > intervention group B (26%) > control group (19%); the effective proportion of people who assisted sleep was intervention group A (83%) > intervention group B (75%) > control group (71%); see Table 2 and Table 3 for details.

Overall, from the perspective of subjective sleep scores, both intervention groups A and B have a certain promoting effect on sleep, and the effective proportion of people who assisted sleep in the intervention group is higher. Because the subjective feeling of sleep quality evaluation itself accounts for a large proportion, this data can be used as a key reference.

Table 2. Sleep outcomes before and after the intervention group A

Statistical analysis of PSQI scoring results	
Experimental phase	Rating (average)
Before the experiment	9.22±2.53a
After the experiment	6.61±2.28b

Table 3. Sleep outcomes before and after the intervention group B

Statistical analysis of PSQI score results	
Group	Rating (average)
Before the experiment	8.50±2.71a
After the experiment	6.31±2.63b

a, b indicates significant differences before and after the test. ($p<0.05$ means there is a significant difference, $p<0.01$ means there is a very significant difference)

3.3. Analysis of Objective Sleep Indicators

3.3.1. Evaluation of Deep Sleep Continuity Index

After two weeks of intervention, the Huawei sports bracelet measurement results are shown in Table 3, Table 4 and Table 5. The deep sleep continuity score of intervention group A increased by an average of 7% after one week, and there was a significant difference. There was a time before and after the experiment. effect. There was a slight improvement between intervention group A and the control group before and after the test, but there was no significant difference. Further comparison between intervention group A and intervention

group B found that the improvement level of deep sleep continuity in intervention group A was significantly higher than that in intervention group B, and there was a statistical difference between the groups. This result shows that taking nutritional dietary supplements can significantly help improve the deep sleep continuity of sleep. (Deep sleep continuity: Deep sleep continuity reflects the degree of deep sleep fragmentation. The better the deep sleep continuity, the more effective the brain rest will be.)

Table 4. Deep sleep continuity scores of the control group during the experimental period

Huawei Sports Band Deep Sleep Continuity Rating			
Groups	Before the test	1 week trial	2 weeks of trial
Control group	64.42±5.05a	67.58±5.84a	66.75±6.03a

Table 5. Deep sleep continuity scores in intervention group A during the trial period

Huawei Sports Band Deep Sleep Continuity Rating			
Groups	Before the test	1 week trial	2 weeks of trial
Intervention group A	64.79±4.56b	69.64±6.45a	67.43±4.91a, b

Table 6. Deep sleep continuity scores in the trial phase of intervention group B

Huawei Sports Band Deep Sleep Continuity Rating			
Groups	Before the test	1 week trial	2 weeks of trial
Intervention group B	62.85±5.61a	63.46±7.10a	64.62±7.16a

Table 7. Comparison of deep sleep continuity scores in different groups during the test phase

Huawei Sports Band Deep Sleep Continuity Rating			
Groups	Before the test	1 week trial	2 weeks of trial
Intervention group A	64.79±4.56b	69.64±6.45a	67.43±4.91a,b
Intervention group B	62.85±5.61b	63.46±7.10b	64.62±7.16b

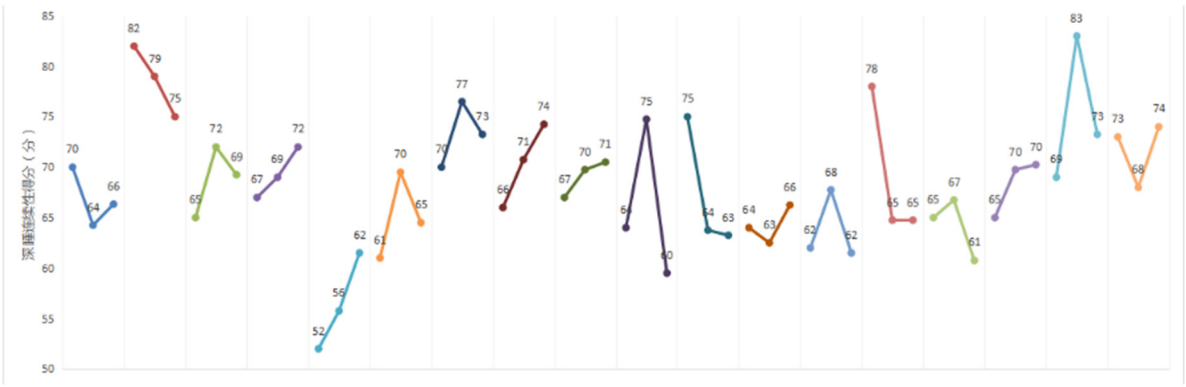

Fig 1. Mean scores of subjects (n=18) in intervention group A before, 1 week after and 2 weeks after the trial

Further analysis of the population revealed that 67% of the subjects in intervention group A had improved deep sleep continuity to varying degrees after taking the product for one week. Further analysis of the experimental population revealed that GABA and asparagus powder had a better effect on people with deep sleep score continuity ≤ 70 points.

3.3.2. Evaluation of Total Sleep Score

As can be seen from Table 8, compared with intervention group B, it was found that after one week of intervention, the total sleep score of intervention group A was significantly improved, and there was a significant difference. This result indicates that nutritional dietary supplements can be helpful in improving overall sleep quality.

Table 8. Comparison of total sleep scores in different groups during the test phase

Huawei Sports Band Sleep Score			
Group	Before the test	1 week trial	2 weeks of trial
Control group	79.06±6.12a,b	80.24±3.36a,b	80.88±4.91a
Intervention group A	80.17±3.96a,b	81.33±2.61a	81.06±2.96a
Intervention group B	79.69±6.01a,b	77.38±4.94b	79.25±3.11a,b

3.3.3. Other Measurement Indicators

This experiment also tested the total sleep time, REM rapid eye movement ratio, awakening times, deep sleep ratio, and light sleep ratio. It was found that there was no difference in time and between groups before and after the experiment. See Table 9 for details.

4. Summary and Outlook

On the whole, people with certain sleep disorders can effectively improve the quality of deep sleep by taking a nutritional dietary supplement containing 120mg GABA and 1500mg asparagus powder every day, thereby improving the overall level of sleep. Compared with pure GABA products, the nutritional dietary supplements combined with "GABA + asparagus powder" have greater advantages in helping sleep. In addition, no obvious side effects were found during the period of taking the nutritional dietary supplements, so taking nutritional dietary supplements containing both GABA and asparagus powder is considered safe and suitable for daily intake to improve sleep quality.

Table 9. Other sleep-related outcome indicators

	Huawei sports bracelet sleep related indicators			
Total sleep time (min)	Control group	405.41±72.73b	410.53±30.57a,b	419.94±55.51a,b
	Intervention group A	441.78±40.54a	422.83±31.25a,b	430.61±39.23a,b
	Intervention group B	429.94±53.99a,b	394.19±47.71b	403.94±40.46b
Deep sleep ratio (%)	Control group	31.12±6.83a	31.35±5.76a	32.00±4.90a
	Intervention group A	30.06±7.64a	31.89±4.16a	30.22±4.97a
	Intervention group B	30.63±7.46a	29.81±4.74a	29.75±4.92a
Light sleep ratio (%)	Control group	48.94±8.80a	48.24±6.06a	47.29±5.08a
	Intervention group A	49.00±8.97a	48.94±4.53a	49.06±3.35a
	Intervention group B	48.19±8.81a	52.13±7.20a	50.38±6.64a
REM rapid eye movement ratio (%)	Control group	19.94±6.03a	20.88±3.66a	21.00±3.20a
	Intervention group A	20.94±6.69a	19.78±3.42a	21.17±3.00a
	Intervention group B	21.19±6.82a	18.44±3.98a	20.50±3.43a

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