

# Analysis of the Sleep Regulation Effects of Herbal Sleep-Aiding Pillows in Treating Insomnia Due to Gallbladder Deficiency

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**Abstract:** *Objective:* To analyze the value of herbal sleep-aiding pillows in regulating sleep quality in patients with insomnia due to gallbladder deficiency. *Methods:* Eighty patients with insomnia due to gallbladder deficiency were treated from April 2023 to April 2024 and were randomly divided into groups by drawing lots. Group A used herbal sleep-aiding pillows, while Group B received Western medication. *Results:* The therapeutic efficacy, HAMA scores, HAMD scores, PSQI scores, and symptom scores of patients in Group A were all superior to those in Group B, with  $p < 0.05$ . *Conclusion:* Treatment with herbal sleep-aiding pillows for insomnia due to gallbladder deficiency resulted in decreased emotional scores, improved sleep quality, and reduced insomnia symptom scores, which is beneficial for the prognosis of patients with insomnia.

**Keywords:** Herbal sleep-aiding pillow; Insomnia due to gallbladder deficiency; Sleep regulation

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## 1. Introduction

Insomnia refers to a category of diseases where individuals, despite being in a suitable sleeping environment, are still unable to enter deep sleep or are dissatisfied with their sleep duration. This condition may adversely affect patients' daytime social functioning and even impact their subjective experience. Insomnia can be triggered by numerous factors, including diseases, physiological conditions, mental states, environmental factors, and medications, with psychological and mental factors playing a significant role<sup>[1]</sup>. Prolonged insomnia in patients can lead to endocrine disorders, circadian rhythm imbalances, and over time, impair the body's immunity, affect cranial thinking, accelerate aging, and even induce various comorbidities. Western medicine often treats insomnia with medications, but these treatments have limitations due to issues such as addiction and muscle relaxation. Traditional Chinese medicine scholars categorize insomnia under the scope of "sleeplessness" based on symptoms and have demonstrated excellent efficacy in regulating insomnia through external treatments, such as herbal sleep-aiding pillows. This study explores the sleep-regulating effects of herbal sleep-aiding pillows using a sample of 80

patients with insomnia due to gallbladder deficiency.

## 2. Materials and methods

### 2.1. Materials

Eighty patients with insomnia due to gallbladder deficiency were treated from April 2023 to April 2024 and were randomly divided into groups by drawing lots. The baseline data for insomnia in Group A were compared with those in Group B, with  $p > 0.05$ . See **Table 1**.

**Table 1.** Baseline data analysis table for patients with insomnia due to gallbladder deficiency

Group	n	Gender		Age (years)		Disease duration (months)	
		Male	Female	Range	Mean $\pm$ SD	Range	Mean $\pm$ SD
A	40	21 (52.50)	19 (47.50)	26–61	50.19 $\pm$ 1.81	3–42	17.68 $\pm$ 1.27
B	40	22 (55.00)	18 (45.00)	26–62	50.21 $\pm$ 1.78	3–41	17.72 $\pm$ 1.29
Statistic ( $\chi^2/t$ )		0.0503			0.0498		0.1397
<i>p</i> -value		0.8226			0.9604		0.8892

### 2.2. Inclusion and exclusion criteria

#### 2.2.1. Inclusion criteria

- (1) Experiencing symptoms such as difficulty falling asleep, early awakening, difficulty maintaining sleep, and low sleep quality
- (2) Signing the informed consent form
- (3) The aforementioned symptoms persist for 3 months, with insomnia occurring at least 3 times per week

#### 2.2.2. Exclusion criteria

- (1) Allergy to traditional Chinese medicine
- (2) Severe physical illnesses
- (3) Sleep disorders induced by external environmental factors, diseases, alcohol, medications, or other causes

### 2.3. Treatment methods

Group A received treatment with a herbal sleep-aid pillow, with the following formula: *Caulis polygoni multiflori*, Silkworm Excrement, and *Concha margaritifera usta*, each 30 g; *Forsythiae fructus* and *Rhizoma Acori Tatarinowii*, each 20 g; *Cassiae semen*, *Radix Acanthopanax Senticosus*, *Radix Polygalae*, and *Radix Curcumae*, each 15 g; *Flos Rosae rugosae* 12 g; *Flos Mume* and *Flos Chrysanthemi*, each 10 g; *Radix Bupleuri* 9 g; and *Herba Menthae* 6 g. The aforementioned herbs were made into a pillow core and placed inside the patient's pillow. Patients were required to lie on the herbal pillow every night at 21:00 until 7:00 the next morning. The herbal pillow was to be placed in a cool, ventilated area during the remaining time to maintain its dryness and avoid odors and insect infestation. The herbal pillow was replaced once a week, and the treatment was administered for 8 weeks.

Group B received oral estazolam at a single dose of 2 mg, once daily, for 8 weeks.

## 2.4. Statistical study

Statistical analysis was performed using SPSS 22.0 software. General data and scale scores were expressed as mean  $\pm$  standard deviation. The  $t$ -test was used for inter-group and pre-post comparisons of intervention effects. A  $p$ -value of less than 0.05 was considered statistically significant.

## 3. Results

### 3.1. Efficacy

The efficacy rate in Group A for patients with timidity-induced insomnia was 97.50%, which was higher than that in Group B at 82.50%, with  $p < 0.05$ . As shown in **Table 2**.

**Table 2.** Efficacy analysis table for patients with timidity-induced insomnia (n, %)

Group	Markedly effective	Effective	Ineffective	Effective rate
Group A (n = 40)	28 (70.00)	11 (27.50)	1 (2.50)	39 (97.50)
Group B (n = 40)	20 (50.00)	13 (32.50)	7 (17.50)	33 (82.50)
$\chi^2$ -value				5.0000
$p$ -value				0.0253

### 3.2. Negative emotions

After 8 weeks of medication, patients with timidity-induced insomnia in Group A had lower HAMA and HAMD scores compared to Group B, with  $p < 0.05$ . As shown in **Table 3**.

**Table 3.** Negative emotion analysis table for patients with timidity-induced insomnia ( $\bar{x} \pm s$ )

Group	HAMA score (points)		HAMD score (points)	
	Before medication	Week 8	Before medication	Week 8
Group A (n = 40)	16.81 $\pm$ 2.14	5.72 $\pm$ 1.02	15.36 $\pm$ 1.89	5.19 $\pm$ 1.01
Group B (n = 40)	16.79 $\pm$ 2.19	7.09 $\pm$ 1.14	15.33 $\pm$ 1.91	7.11 $\pm$ 1.17
$t$ -value	0.0413	5.6643	0.0706	7.8564
$p$ -value	0.9672	0.0000	0.9439	0.0000

### 3.3. Sleep quality

After 2, 3, and 4 weeks of medication, the PSQI scores of patients with timidity-induced insomnia in Group A were lower than those in Group B, with  $p < 0.05$ . As shown in **Table 4**.

**Table 4.** Sleep quality score analysis table for patients with timidity-induced insomnia ( $\bar{x} \pm s$ )

Group	Before treatment	Week 2 of treatment	Week 3 of treatment	Week 4 of treatment
Group A (n = 40)	17.33 $\pm$ 1.51	11.28 $\pm$ 1.24	9.48 $\pm$ 0.89	8.41 $\pm$ 0.72
Group B (n = 40)	17.42 $\pm$ 1.48	14.21 $\pm$ 1.33	12.44 $\pm$ 0.96	10.86 $\pm$ 0.91
$t$ -value	0.2692	10.1909	14.3006	13.3534
$p$ -value	0.7885	0.0000	0.0000	0.0000

### 3.4. Symptom score

After 8 weeks of medication, the symptom scores of patients with timidity-induced insomnia in Group A were all lower than those in Group B, with  $p < 0.05$ , as shown in **Table 5**.

**Table 5.** Analysis table of symptom scores for patients with timidity-induced insomnia ( $\bar{x} \pm s$ )

Group	Difficulty falling asleep		Dream-disturbed sleep		Restlessness		Mental fatigue	
	Before Treatment	After Treatment	Before Treatment	After Treatment	Before Treatment	After Treatment	Before Treatment	After Treatment
Group A (n = 40)	2.41 ± 0.35	0.61 ± 0.28	2.43 ± 0.38	0.59 ± 0.25	2.42 ± 0.36	0.61 ± 0.21	2.45 ± 0.37	0.59 ± 0.23
Group B (n = 40)	2.42 ± 0.36	1.33 ± 0.31	2.45 ± 0.39	1.36 ± 0.31	2.44 ± 0.38	1.28 ± 0.32	2.46 ± 0.38	1.31 ± 0.33
<i>t</i> -value	0.1260	10.9010	0.2323	12.2284	0.2416	11.0710	0.1192	11.3207
<i>p</i> -value	0.9001	0.0000	0.8169	0.0000	0.8097	0.0000	0.9054	0.0000

## 4. Discussion

Patients with insomnia often experience symptoms such as difficulty falling asleep, early awakening, frequent awakenings, and vivid dreaming. Long-term insomnia leads to insufficient sleep efficiency, failing to meet patients' daily needs, and can result in secondary daytime dysfunction. Based on modern medical theory, the pathogenesis of insomnia is complex and closely related to various factors such as endocrine dysfunction, poor environment, genetics, and high psychological stress [2]. Currently, Western medicine primarily treats insomnia with estazolam, which has a rapid onset of action but is associated with issues such as drug resistance and dependence. Long-term use can impair patients' cognitive function, increase the risk of daytime sleepiness, and reduce drug efficacy over time [3].

Traditional Chinese medicine scholars categorize insomnia under the term “insomnia disorder” and believe that its pathogenesis involves Yin-Yang disharmony and dysfunction of the internal organs, leading to disharmony between the nutrient and defensive aspects of Qi over time. A common syndrome type is “timidity-induced insomnia,” which is related to the heart being undernourished due to weakness of gallbladder Qi, and can induce symptoms such as sleeplessness, vexation, restlessness, and palpitations. This paper selects herbal sleep-aid medicinal pillows for the treatment of patients with insomnia, which can effectively improve their sleep quality. Through the synergistic effects of acupoint stimulation, transdermal absorption, aromatic volatilization, and various other pathways, highly efficient improvement in insomnia can be achieved. The herbal sleep-aid medicinal pillow in this paper incorporates multiple Chinese herbal medicines, which collectively work to calm the mind, nourish the heart, promote bile flow, soothe the liver, open the orifices, emit fragrance, remove blood stasis, and clear heat.

Based on pharmacological analysis of traditional Chinese medicine, the herbs in the herbal sleep-aid medicinal pillow complement each other. Mint can dispel wind-heat and clear the head and eyes; chrysanthemum can detoxify, clear heat, improve eyesight, and soothe the liver; *Caulis polygoni multiflori* can nourish the liver and kidneys, calm the mind, and nourish the heart; *Acanthopanax senticosus* can calm the mind, nourish the kidneys, invigorate the spleen, and replenish Qi; *Acorus tatarinowii* can calm the heart and mind, open the orifices, and remove dampness; cassia seeds can improve eyesight, regulate emotions, promote bowel movements, and

moisten the intestines; white bupleurum can elevate yang, relieve depression, and soothe the liver; polygala can nourish the heart, enhance intelligence, and calm the mind; silkworm excrement can resolve turbidity, harmonize the stomach, and dispel wind-dampness; mother-of-pearl can calm the mind, sedate, soothe the liver, and subdue yang; forsythia can reduce swelling, disperse nodules, detoxify, and clear heat; turmeric tuber can clear the heart, relieve depression, promote the circulation of Qi, and activate blood; rose can relieve depression, soothe the liver, harmonize blood, and promote the circulation of Qi; plum blossom can disperse nodules, eliminate phlegm, harmonize the middle, and soothe the liver. The combined use of various formulas in herbal sleep-aid pillows can work together to regulate Qi movement and disperse gallbladder stagnation, thereby helping to stabilize the spirit and soul of patients suffering from insomnia due to gallbladder deficiency.

Based on modern pharmacological analysis, herbal sleep-aid pillows offer holistic regulation and multi-target effects. For instance, the menthol component in mint can provide local anesthesia and sedation; the flavonoids in chrysanthemum can regulate neurotransmitters, while also exhibiting antioxidant and anti-inflammatory properties; the phospholipids and anthraquinones in fleecflower stem can enhance memory and improve sleep quality in patients; saponins and *acanthopanax senticosus* can alleviate the body's stress response and achieve adaptive restoration; the volatile oil  $\beta$ -asarone in sweet flag can prevent convulsions and provide sedation; the chrysophanol in cassia seed can promote bowel movements and laxation, as well as prevent gastrointestinal heat accumulation; the saponins in *Bupleurum* and *Polygala* can regulate the HPA axis, reduce depression and anxiety, stimulate the expression of nerve growth factors, and optimize cognitive function in patients; the amino acids and chlorophyll in silkworm excrement can protect nerve function; mother-of-pearl is rich in amino acids and calcium carbonate, which can block the central nervous system; the curcumin in turmeric and forsythiaside in *Forsythia* are rich in components that can protect nervous system function, providing antibacterial and anti-inflammatory effects; the aromatic alcohols and volatile oils in plum blossom and rose can regulate the olfactory nerve, helping to relieve patient anxiety and improve sleep quality. The synergistic effects of the aforementioned herbs can accelerate local skin and respiratory absorption, facilitating the regulation of neurotransmitter levels related to sleep, including GABA and 5-HT<sup>[4]</sup>.

Based on the data analysis in this article, patients with insomnia due to gallbladder deficiency exhibited excellent therapeutic outcomes after treatment with herbal sleep-promoting pillows. The reason for this is that these pillows can achieve a "holistic treatment" effect, aligning with the modern pathogenesis of "gallbladder deficiency and liver stagnation" in insomnia patients. When using herbal sleep-promoting pillows to treat insomnia, the combination of *Polygonum multiflorum* and *Acanthopanax senticosus* can calm the mind, nourish the heart, strengthen the spleen, and replenish Qi, optimizing the body's microcirculation and replenishing energy. This can alleviate symptoms such as fatigue and mental exhaustion, thereby compensating for the lack of overall tonic effects in Western medicine.

Another set of data indicates that after treatment with herbal sleep-promoting pillows, HAMA and HAMD scores decreased in patients with insomnia due to gallbladder deficiency. The reason for this is that chrysanthemum, plum blossom, and rose contain abundant volatile aromatic oils. When placed in a medicinal pillow and inhaled through the nose, these oils can exert pharmacological effects on systems such as the hypothalamus, hippocampus, and amygdala, enhancing patients' memory abilities and stabilizing their emotions. Furthermore, aromatic molecules can regulate the release of neurotransmitters such as DA and 5-HT in the body, enhancing antidepressant and anxiolytic effects, thus leading to a decrease in HAMA and HAMD scores<sup>[5]</sup>. Another set of data indicates that after treatment with herbal sleep-aid pillows, the PSQI scores of patients with

insomnia due to timidity of the gallbladder decreased.

Analyzing the reasons, the treatment with herbal sleep-aid pillows regulates patients' sleep quality through multiple targets, shortens their sleep latency, which is related to the ability of drugs such as chrysanthemum and mint to clear the head and eyes, calm the liver, and clear heat, reducing patients' irritability and optimizing their sleep quality. Meanwhile, mother-of-pearl can calm the mind and suppress, blocking central nervous system excitation and accelerating patients' entry into deep sleep states; it can also inhibit sleep disorders and optimize nighttime sleep efficiency, which is related to the ability of drugs such as *Acanthopanax senticosus* and *Caulis polygoni multiflori* to tonify the kidneys, enhance intelligence, and calm the mind. Moreover, active ingredients such as acanthopanax glycosides and anthraquinone glycosides can exert a mild regulatory effect on the GABAergic system, thereby prolonging patients' deep sleep duration and improving sleep structure, which is beneficial for alleviating symptoms such as easy awakening and dreaminess; it can also reduce the degree of daytime dysfunction. For example, the medicinal components of *Acanthopanax senticosus* can enhance the body's resistance to fatigue, while the medicinal components of *Caulis polygoni multiflori* can regulate Qi and blood, alleviating symptoms of fatigue and weakness caused by restless sleep, which is conducive to establishing a healthy sleep-wake cycle <sup>[6]</sup>. The last set of data indicates that after treatment with herbal sleep-aid pillows, the symptom scores of patients with insomnia due to gallbladder deficiency decreased across all categories. Herbal sleep-aid pillows can provide targeted conditioning for symptoms of insomnia due to gallbladder deficiency. For instance, herbs such as mint and conch shell are used to alleviate the symptom of "difficulty falling asleep," exerting effects such as clearing the head and eyes and soothing the liver. Herbs like *Acorus gramineus* and *Polygala tenuifolia* are employed to regulate the symptom of "excessive dreaming," delivering sedative and tranquilizing effects. Cassia seed, chrysanthemum, and forsythia are utilized to address the symptom of "restlessness and unease," exhibiting effects such as cooling the blood, clearing the heart, relieving depression, and promoting the flow of Qi. *Polygonum multiflorum* stem and *Eleutherococcus senticosus* are used to modulate the symptom of "mental and physical fatigue," providing sedative, kidney-tonifying, spleen-strengthening, and Qi-invigorating effects <sup>[7]</sup>.

## 5. Conclusion

In summary, patients with insomnia due to gallbladder deficiency who received treatment with herbal sleep-aid pillows experienced a decrease in symptom scores, improved sleep quality, and reduced anxiety and depression, demonstrating its potential for widespread application.

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## Disclosure statement

The author declares no conflict of interest.

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