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Clinical Observation on the Treatment of Sleep Disorders in Children with Autism Spectrum Disorder by Cheek Acupuncture

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Abstract: ***Objective**: To investigate the clinical efficacy of buccal acupuncture in treating sleep disorders in children with autism spectrum disorder (ASD). **Methods**: A total of 60 hospitalized children diagnosed with ASD complicated by sleep disorders from July 1, 2024 to December 31, 2025 were selected and randomly divided into a treatment group (n=30) and a control group (n=30). The treatment group received buccal acupuncture combined with rehabilitation education, while the control group received parental sleep education combined with rehabilitation education. Assessments were conducted before and after treatment using the Children's Sleep Habits Questionnaire (CSHQ), Childhood Autism Rating Scale (CARS), and Autism Behavior Checklist (ABC) to compare the clinical efficacy between the two groups. Paired t-tests were used for within-group comparisons, and independent t-tests or Mann-Whitney U tests were used for between-group comparisons. Adverse reactions during treatment were recorded in both groups. **Results**: Within-group comparison: After treatment, both groups showed significant improvements in five indicators—sleep habits, sleep latency, sleep duration, sleep anxiety, and daytime sleepiness (all P<0.05); the treatment group also demonstrated significant improvements in CARS and ABC scores (all P<0.05). Between-group comparison: The treatment group exhibited significantly greater improvements than the control group in CARS score, ABC score, CSHQ total score, sleep habits, sleep latency, sleep duration, sleep anxiety, and daytime sleepiness (all P<0.05); no significant differences were observed between the two groups in sleep duration, nocturnal awakenings, paradoxical sleep, or sleep-disordered breathing (all P>0.05). **Conclusion**: Buccal acupuncture effectively improves sleep disorders in children with autism spectrum disorder (ASD), demonstrating significant efficacy particularly in reducing the total CSHQ score, modifying sleep habits, shortening sleep latency, increasing sleep duration, alleviating sleep anxiety, and reducing daytime sleepiness. It also enhances core ASD symptoms and broad behavioral issues, making it clinically valuable for widespread application.*

Keywords: Buccal acupuncture, Autism spectrum disorder, Sleep disorders, Children's Sleep Habits Questionnaire, Clinical study.

1. Introduction

Autistic spectrum disorders (ASD) represent a group of neurodevelopmental disorders characterized primarily by impairments in social interaction and communication, repetitive and stereotyped behaviors, and restricted interests [1]. Studies indicate that the prevalence of co-occurring sleep disorders in children with ASD is 77.5%, with an incidence rate as high as 71.5%–89.94% in China, exceeding international rates by over 10% [2, 3]. Sleep disturbances in children with ASD may exacerbate core symptoms and are more likely to be accompanied by hyperactivity, anxiety, attention deficits, and emotional disturbances [4]. Research suggests that communication impairments in ASD children are associated with shorter sleep duration, while social interaction difficulties correlate with increased bedtime resistance behaviors, and heightened sensitivity to sensory stimuli is linked to sleep-related anxiety [5]. Concurrent sleep problems can worsen abnormal behavioral and emotional dysregulation symptoms in ASD children [6, 7], adversely affecting neurodevelopmental progress and family quality of life.

Traditional Chinese Medicine (TCM) identifies the etiology of pediatric sleep disorders primarily into external factors such as pathogenic invasion and internal factors including visceral dysfunction and emotional imbalance. The pathogenesis mainly involves yin-yang imbalance and failure of nutrient defense mechanisms [8]. The pathological site of sleep disorders in autism spectrum disorder (ASD) lies in the brain, with close correlations to visceral organs such as the heart, spleen, liver, and kidneys [9]. Current modern medical treatments for ASD-associated sleep disorders primarily focus on parent education and behavioral therapy; melatonin and other sedative medications are administered when these approaches prove ineffective [3, 10]. In recent years, TCM modalities such as acupuncture, oral herbal decoctions, and auricular acupoint embedding have garnered widespread attention [11–14], with acupuncture demonstrating particularly remarkable therapeutic efficacy [15]. Cheek acupuncture therapy, a key branch of the micro-acupuncture system, has evolved over approximately 30 years, grounded in holographic theory, the theory of the Greater Triple Energizer, and psychosomatic theory [16]. By stimulating specific acupoints on the cheek region to regulate visceral functions, this technique offers precise acupoint selection and safe operation, exhibiting distinct advantages in treating sleep disorders in ASD children [17, 18].

This study evaluates the clinical efficacy of buccal needle therapy in children with autism spectrum disorder (ASD) accompanied by sleep disorders, aiming to provide novel insights and clinical evidence for the treatment and further research on sleep disturbances in ASD children.

2. Materials and Methods

2.1 General Data

A total of 60 children with ASD and comorbid sleep disorders who were hospitalized in the 12th Department of Encephalopathy at Xi'an Hospital of Traditional Chinese

Medicine from March 15,2024, to December 15,2025, were selected. They were randomly assigned to a treatment group and a control group using a random number table, with 30 cases in each group. The treatment group comprised 27 males and 3 females, aged 3.13–10.09 years (mean age: 5.94 years), while the control group consisted of 30 males and 3 females, aged 3.22–10.75 years (mean age: 5.76 years). No statistically significant differences were observed between the two groups in baseline characteristics such as gender and age (P> 0.05), indicating balanced baseline conditions and comparability. See Table 1.

This clinical study has been reviewed and approved by the hospital's ethics review committee, and all guardians of the pediatric patients have signed the informed consent forms.

Table 1: Baseline Data Comparison

variable	treatment group (n=30)	control group (n=30)	statistics	P value
Gender: Male/Female	27/3	27/3	X^2=0.000	p=1.000
Age (years, mean ± standard deviation)	5.94±1.93	5.76±2.18	t=0.34	p=0.730

2.1.1 Diagnostic Criteria

ASD Diagnosis: Meeting the diagnostic criteria for ASD as outlined in the Diagnostic and Statistical Manual of Mental Disorders (DSM-5) [19], confirmed by the Child Autism Rating Scale (CARS) assessment (total score ≥30);

Sleep Disorder Diagnosis: Based on the pediatric sleep disorder criteria of the International Classification of Sleep Disorders (ICSD-3) [20], combined with screening using the Child Sleep Habits Questionnaire (CSHQ) (total score ≥41).

2.1.2 Inclusion Criteria

(1) Meet the aforementioned diagnostic criteria; (2) Age between 3 and 10 years; (3) No other acupuncture/medication intervention related to the disease was administered during the treatment period other than this protocol; (4) Ability to complete two courses of systematic treatment; (5) The child's major family member consents to the treatment and signs the informed consent form.

2.1.3 Exclusion Criteria

(1) Presence of other systemic diseases requiring special management during treatment that may interfere with the primary diagnosis; (2) Hospitalized children aged <3 years or>10 years; (3) History of needle phobia; (4) Inability to adhere to the treatment regimen; (5) Presence of severe somatic disorders such as childhood schizophrenia or bipolar disorder; (6) Sleep disorders caused by sleep apnea syndrome or other underlying conditions.

2.2 Methods

2.2.1 Treatment Group

Cheek Acupuncture Patients were seated, and the following acupoints were selected: CA-1 (face of the affected side), CA-5 (neck), CA-9 (shoulder), CA-6 (back), CA-2 (upper jiao), CA-3 (middle jiao), and CA-4 (lower jiao). After routine disinfection, a 0.16 mm × 20 mm cheek needle was inserted vertically into these acupoints to a depth of approximately 5–10 mm. The insertion was halted upon sensation of obstruction; no tonifying or draining techniques were employed, and no intense needle sensation was observed. The needles were retained for 30 minutes. One session was administered every 3 days, with 5 sessions constituting one treatment course. Two consecutive courses were administered.

Rehabilitation Education: Includes Applied Behavior Analysis (ABA), speech therapy, sensory integration training, and behavioral correction therapy, administered by professionally trained and qualified rehabilitation therapists. The session lasts 30 minutes per item, once daily for six days per week, with one month constituting a treatment course.

2.2.2 Control Group

Sleep Education for Parents in the Aims to teach parents sleep strategies and techniques, including establishing a bedtime routine, fostering early sleep and wake habits to assist children in falling asleep, helping them fall back asleep after nighttime awakenings, delaying bedtime until the child feels sleepy, increasing daytime activity levels, and reducing or avoiding caffeine-containing beverages. Parents are guided to implement these educational practices consistently for one month.

Rehabilitation Education: The content is the same as that in the treatment group.

2.3 Observation Indicators

This study employed a multidimensional assessment tool to comprehensively evaluate the intervention effects across three dimensions: sleep behavior, core symptoms, and broad behavioral problems.

2.3.1 Sleep assessment

Sleep assessment was conducted using the Children's Sleep Habits Questionnaire (CSHQ) [21, 22] to evaluate the child's sleep disorder behaviors and severity before and after treatment. The questionnaire covers eight dimensions — bedtime habits, sleep latency, sleep duration, sleep anxiety, nocturnal awakenings, paradoxical sleep, sleep-disordered breathing, and daytime sleepiness—with a total of 33 items. A total score ≥41 is generally defined as indicating the presence of sleep disorders, with higher scores indicating more severe sleep disturbances.

2.3.2 Symptom Assessment

The severity of core symptoms in pediatric patients was evaluated before and after treatment using the Childhood Autism Rating Scale (CARS) [23]. The CARS scale consists of 15 items, each scored on a 1–4 scale, with a total score ranging from 15 to 60 points. A higher score indicates more severe autism symptoms.

The Autism Behavior Checklist (ABC) [24] was used to

assess the child's broad behavioral issues before and after treatment. The ABC scale comprises 57 items, covering five dimensions: sensory, social, somatosensory-motor, language, and self-care. It employs a 0–3-point scoring system, with a total score ranging from 0 to 159 points, where higher scores indicate more severe behavioral problems.

2.4 Statistical Methods

Statistical analysis was performed using SPSS 19.0 software. Measurement data were expressed as mean ± standard deviation ($\bar{x} \pm s$). Normality testing for data across groups was conducted using the Shapiro-Wilk test; intra-group comparisons were performed with the paired samples t-test, while inter-group comparisons employed the independent samples t-test for data conforming to normal distribution and the Mann-Whitney U test for data deviating from normal distribution.

This study involved intergroup comparisons across multiple indicators. To control for Type I error, Bonferroni correction was applied to each subscale of the CSHQ, with the post-correction significance level set at α '= 0.05/8 = 0.00625. For marginally significant or clinically meaningful results, effect sizes were calculated: the Cohen's d was used for the independent samples t-test, where d = 0.2, 0.5, and 0.8 represented small, moderate, and large effects, respectively; the Mann-Whitney U test employed $r = Z/\sqrt{N}$, with r = 0.1, 0.3, and 0.5 indicating small, moderate, and large effects, respectively.

All tests were conducted as two-tailed tests with an alpha level of 0.05; a P-value <0.05 was considered statistically significant.

3. Results

3.1 Comparison of Total CSHQ Scores Before and after Treatment Between the Two Groups of Children.

After treatment, the total scores of both groups were lower than those before treatment, with the treatment group showing superior improvement compared to the control group, and the difference was statistically significant (P<0.05), as shown in Table 2.

Table 2: Comparison of Total CSHQ Scores($\bar{x} \pm s$)

group	Number of cases	prethera py	post-treat ment	Differenc e before and after treatment	t valu e	P value
treatment group	30	68.33±9. 77	38.67±2. 92	-29.67±9. 97	16.3 0	P<0.0 01
control group	30	62.27±8. 05	48.40±6. 29	-13.87±8. 88	8.56	P<0.0 01
t value		2.62	-7.68	-6.48		
P value		0.011	<0.0001	<0.0001		

3.2 Comparison of CSHQ Subscale Scores Between the Two Groups Before and After Treatment

In the CSHQ subscale, the treatment group demonstrated significantly better outcomes than the control group in five aspects: sleep habits, sleep latency, sleep duration, sleep anxiety, and daytime sleepiness (all P <0.05). No significant differences were observed between the groups in sleep duration, nocturnal awakenings, paradoxical sleep, or sleep-disordered breathing (all P> 0.05). Within-group comparisons revealed significant improvements in all indicators except sleep-disordered breathing (all P <0.05). See Table 3.

Table 3: Comparison of scores for common sleep disorder questions($\bar{x} \pm s$)

group	Sleep duration	Bedtime habits	Sleep latency period	Sleep duration	Sleep Anxiety	Waking up at night	parasomnias	respiratory disorder during sleep	Dawn drowsiness
treatment group (n=30)									
pretherapy	7.86±1.32	11.87±2.00	2.93±0.26	7.60±1.64	9.60±1.96	5.60±1.88	9.00±1.60	3.20±0.41	18.47±3.82
post-treatment	9.32±0.65	7.00±1.31	1.33±0.62	3.27±0.59	5.27±1.22	3.20±0.41	6.67±0.82	3.13±0.35	8.73±0.80
t value	-6.06	13.34	33.71	14.46	12.10	6.99	7.98	0.94	13.97
P value	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.357	<0.001
control group (n=30)									
pretherapy	6.85±0.98	10.60±1.99	2.87±0.35	7.47±0.83	9.00±1.93	5.93±1.28	8.40±1.72	3.00±0.10	15.00±4.07
post-treatment	7.77±1.13	8.47±1.30	2.27±0.70	5.27±1.79	6.93±1.28	4.47±1.64	7.00±1.13	3.07±0.26	10.93±2.31
t value	-5.14	5.86	9.39	14.52	5.87	6.25	4.46	1.475	4.765
P value	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.151	<0.001
Inter-group comparison (Δ value)*1									
t value	-1.44*2	-4.45*3	-5.31*3	-4.43*3	-3.79*3	-1.80*2	-1.86*2	-1.79*2	-5.10*3
P value	0.156	<0.001	<0.001	<0.001	<0.001	0.077	0.068	0.079	<0.001

Note: *Inter-group comparison: compares the difference in change values (Δ = post-treatment-pre-treatment) between the two groups; *2: Independent samples t-test (with equal variances) was used, with the t-value reported; *3: Mann-Whitney U test was employed, with the U-value reported.

3.3 Comparison of CARS Scores Between the Two Groups Before and After Treatment

The CARS scores of both groups showed significant improvement after treatment compared to baseline. The treatment group exhibited an average score reduction of 3.00 points (t=5.06, P<0.001), while the control group showed an average reduction of 0.93 points (t=7.28, P<0.001). Comparison of the change values (Δ) revealed that the improvement in the treatment group was significantly greater than that in the control group, with a statistically significant difference (P<0.05).

Table 4: Comparison of CARS scores($\bar{x}\pm s$)

group	Number of cases	prethera py	post-tre atment	Change value (Δ*)	t value	P value
treatment group	30	40.40±5 .05	37.40± 3.89	-3.00±3.2 5	t=5.06	P< 0.001
control group	30	37.67±2 .87	36.73± 2.74	-0.93±0.7 0	t=7.28	P< 0.001
t value				t=-3.41		
P value				P=0.0012		

*Note: Δ = post-treatment score – pre-treatment score; negative values indicate a decrease in score (symptom improvement).

3.4 Comparison of ABC Scores Between the Two Groups Before and after Treatment

In terms of ABC scores, the improvement magnitude in the treatment group (-5.13 ± 5.29) was superior to that in the control group (-2.13 ± 2.33), with the difference in change values being statistically significant ($t(58) = -2.84$, $P = 0.006$). Further calculation of Cohen's d effect size: pooled standard deviation ≈ 4.09, d ≈ 0.73, indicating that the clinical improvement advantage in the treatment group exhibited an above-average effect strength.

Table 5: Comparison of ABC scores($\bar{x}\pm s$)

group	Number of cases	pretherap y	post-treat ment	t value	P value	Change value (Δ*)
treatment group	30	88.07±1 6.85	82.93±15. 39	t=5.31	P< 0.001	-5.13±5 .29
control group	30	90.73±1 5.82	88.60±15. 39	t=5.00	P< 0.001	-2.13±2 .33
comparison among groups				t(58)=-2 .84	P=0.0 06	

*Note: Δ = Post-treatment score-Pre-treatment score; a negative value indicates a decrease in score (symptom improvement).

4. Discussion

This study investigated the efficacy of buccal acupuncture in improving sleep disorders in children with autism by comparing changes in sleep-related indicators between the treatment group and the control group before and after intervention. The results demonstrated that the treatment group showed significant improvements in all six indicators—CSHQ total score, sleep habits, sleep latency, sleep duration, sleep anxiety, and daytime sleepiness—and exhibited markedly superior outcomes compared to the control group. These findings suggest that buccal acupuncture may effectively enhance both the depth and quality of children's sleep, rather than merely reducing nocturnal awakenings. When combined with rehabilitation interventions, it facilitates the establishment of effective bedtime routines, reduces sleep resistance behaviors, and accelerates sleep onset. Although both groups showed increases in total sleep duration, the differences were not statistically significant, likely due to influences from lifestyle patterns, family environment, and baseline differences (7.86 hours in the treatment group vs. 6.85 hours in the control group), indicating a potential "ceiling effect" in the treatment group. Both groups demonstrated significant intra-group improvements across all sleep-related indicators except for sleep-disordered breathing (all $P < 0.05$), suggesting that the health education and routine rehabilitation interventions provided to the control group were effective, while the attention and parental expectations associated with participation positively influenced both groups. Notably, the treatment group exhibited significantly greater improvements across multiple key indicators than the control group, confirming the therapeutic efficacy of buccal acupuncture.

This study employed the CARS and ABC scales to evaluate the intervention effects across different dimensions. In terms of CARS scores, the treatment group demonstrated superior improvement compared to the control group, indicating a clear therapeutic effect. The control group also showed significant improvement in CARS scores, which may be attributed to the inherent efficacy of its routine training regimen. Regarding ABC scores, the difference in improvement between the two groups reached traditional statistical significance, with the treatment group exhibiting a more pronounced improvement trend. These findings may reflect the differing sensitivities of the two scales to various symptoms. Additionally, buccal needle therapy likely primarily affects sleep behaviors—which exhibit higher plasticity—and the core symptoms assessed by the CARS scale. Although statistical differences were observed in the behavioral issues measured by the ABC scale, further amplification of its clinical effect magnitude may require a longer intervention duration or a larger sample size. Overall, the study results support the efficacy of the intervention protocol in the treatment group.

The study found that sleep disorders should be identified as a key target for intervention, as targeted interventions can effectively improve sleep issues in children with ASD, potentially enhancing their daytime functioning. This study compared multiple indicators; although some exploratory analyses were not strictly adjusted, the results of the primary indicators support the main conclusions. However, the following limitations remain: (1) The small sample size may have resulted in insufficient statistical power for certain indicators, masking genuine differences and affecting the generalizability of the findings; (2) The short intervention duration and lack of long-term follow-up prevented assessment of the durability of effects; (3) Sleep assessment relied solely on parent-reported CSHQ questionnaire results without measuring biomarkers such as serum melatonin and cortisol, lacking objective monitoring metrics and potentially introducing reporting bias. Future studies could expand the sample size to validate improvements in significant indicators, extend follow-up periods to evaluate long-term effects, employ objective sleep monitoring devices for more precise sleep parameters, and integrate multi-omics analyses to elucidate therapeutic mechanisms, thereby further investigating the relationship between sleep improvement and core symptom reduction.

5. Conclusion

This study confirms that buccal acupuncture therapy effectively improves sleep disturbances in children with autism spectrum disorder (ASD), particularly in terms of CSHQ total score, sleep habits, sleep latency, sleep duration, sleep anxiety, and daytime sleepiness, as well as alleviating core symptoms and behavioral issues. No cases were dropped from the study, and no adverse reactions such as needle syncope or hematoma were reported. Compared to traditional

body acupuncture and scalp acupuncture, buccal acupuncture employs finer needles and shallower insertion depths, allowing physicians to rapidly insert the needles with a cannula and perform painless needle adjustment post-insertion. The acupoint stimulation does not aim for the traditional needle sensations of soreness, numbness, distension, or pain but rather focuses on tolerable subthreshold perceptions or mild sensations. Its pain-free nature enhances patient acceptance, making it worthy of further clinical promotion. This study provides preliminary empirical support for the clinical application of buccal acupuncture in managing sleep disorders associated with autism spectrum disorder. However, more rigorous experimental designs are needed to provide robust evidence for the widespread adoption of non-pharmacological therapies in neurodevelopmental disorders.

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