

Integrative Group Intervention for Sleep Quality in College Students with High Procrastination: The Mediating Role of Anxiety

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Abstract: Procrastination behavior, sleep disorders, and anxiety are highly prevalent and intertwined mental health problems among contemporary college students, which seriously affect their academic performance and quality of life. This study adopted a randomized controlled trial (RCT) design to investigate the improvement effect of an integrative group intervention combining time management and cognitive-behavioral techniques on sleep quality in college students with high procrastination, and to examine the mediating role of anxiety in this process. Sixty college students with high procrastination and sleep problems were selected from a university using the General Procrastination Scale (GPS) and Pittsburgh Sleep Quality Index (PSQI), and randomly divided into an intervention group and a waitlist control group (30 participants each). The intervention group received an 8-week integrative group intervention (90 minutes per week), while the control group received no intervention during the study period. Assessments were conducted at three time points: pre-intervention (T1), immediate post-intervention (T2), and 3-month follow-up (T3). The expected results show that after the intervention, the intervention group will have significantly lower procrastination and anxiety levels and significantly better sleep quality than the control group; anxiety will play a partial mediating role between the intervention and sleep quality improvement. The results of this study will provide empirical evidence for college clinical psychologists to develop targeted intervention programs for procrastination and sleep problems.

Keywords: Procrastination Behavior, Sleep Quality, Anxiety, Group Intervention, Mediating Effect.

1. Introduction

1.1. Research Background

Procrastination refers to the behavior in which individuals voluntarily delay starting or completing scheduled tasks despite foreseeing adverse consequences of the delay. Global research over the past decade has shown that procrastination has become a widespread phenomenon among college students. A meta-analysis by Steel (2007) showed that approximately 15%-20% of adults in the general population experience chronic procrastination, while the prevalence rate among college students is as high as 70%-80% [1]. The latest domestic survey shows that 93.33% of college students have varying degrees of procrastination habits, of which about 40% are chronic procrastinators [3].

Procrastination not only leads to decreased academic performance and learning efficiency among college students but is also closely related to a series of mental health problems [4]. Numerous studies have shown a significant positive correlation between procrastination and negative emotions such as anxiety and depression [5]. Chronic procrastinators often experience persistent self-blame, guilt, and anxiety due to task backlog, and these negative emotions further exacerbate procrastination behavior, forming a vicious cycle. Meanwhile, sleep quality problems among college students have become increasingly prominent. A 2026 global meta-analysis showed that the pooled prevalence of insomnia symptoms among undergraduate students is 46.9%, manifesting as difficulty falling asleep, sleep maintenance disorders, early awakening, and daytime dysfunction [7].

A growing number of studies have found a significant association between procrastination behavior and sleep quality. A 2025 longitudinal study showed that college students with more severe procrastination have poorer sleep

quality, longer sleep onset latency, and lower sleep efficiency, and this association is stable across time [8]. However, the underlying mechanism of the relationship between procrastination and sleep quality remains unclear. Some scholars have proposed that anxiety may be an important mediating variable linking procrastination and sleep quality. Task pressure and negative emotions caused by procrastination can trigger anxiety, which is one of the core psychological factors affecting sleep quality. However, most existing studies have adopted cross-sectional designs, which cannot determine the causal relationship among the three variables, and there is a lack of empirical evidence verifying the mediating mechanism through intervention research.

1.2. Research Status

Current intervention studies on college students' procrastination behavior mainly focus on two aspects: time management training and cognitive-behavioral intervention. Single time management interventions mainly improve procrastination by teaching students skills such as planning, goal setting, and prioritization. Although they can achieve certain effects in the short term, they have limited effectiveness on chronic procrastination caused by irrational beliefs and negative emotions. Cognitive-behavioral interventions, on the other hand, focus on changing procrastinators' irrational cognitions such as perfectionism and catastrophic thinking, while teaching emotion regulation skills, but they pay insufficient attention to time management skills.

In the intervention of sleep disorders, Cognitive Behavioral Therapy for Insomnia (CBT-I) is recognized as the first-line treatment for insomnia, with better efficacy than drug treatment and long-term effects. However, CBT-I mainly targets sleep problems themselves and pays less attention to

upstream factors leading to sleep problems, such as procrastination behavior [13]. In recent years, scholars have begun to try to integrate multiple intervention techniques to improve intervention effects. A 2025 systematic review pointed out that an intervention model integrating time management and cognitive-behavioral techniques may be more suitable for treating chronic procrastination, as it can improve both behavioral time management problems and cognitive and emotional problems. However, there are still few empirical studies on the improvement effect of this integrative intervention on procrastination and secondary sleep problems.

Regarding the mediating role of anxiety between procrastination and sleep quality, several cross-sectional studies have provided preliminary evidence. A 2024 study of 5,704 Chinese college students found that procrastination not only directly affects sleep quality but also indirectly affects it through the mediating role of anxiety [9]. However, cross-sectional studies cannot determine the causal direction of variables, nor can they verify whether reducing anxiety through intervention can improve sleep quality. Therefore, it is necessary to adopt an intervention research design to further examine the mediating role of anxiety.

1.3. Research Purpose and Hypotheses

This study aims to verify the improvement effect of an integrative group intervention combining time management and cognitive-behavioral techniques on procrastination behavior, anxiety, and sleep quality in college students with high procrastination using a randomized controlled trial design, and to examine the mediating role of anxiety between the intervention and sleep quality improvement. Based on previous research results, this study proposes the following hypotheses:

The intervention group will have significantly lower procrastination scores and significantly higher sleep quality scores than the control group at immediate post-intervention and 3-month follow-up.

The intervention group will have significantly lower anxiety levels than the control group at immediate post-intervention and 3-month follow-up.

Anxiety will play a partial mediating role between the integrative group intervention and sleep quality improvement.

2. Research Methods

2.1. Participants

Participants were recruited from a comprehensive university through campus posters and online promotion using the convenience sampling method. Inclusion criteria: (1) Full-time undergraduate college students aged 18-25 years; (2) General Procrastination Scale (GPS) score ≥ 60 , indicating moderate or above procrastination behavior; (3) Pittsburgh Sleep Quality Index (PSQI) score ≥ 7 , indicating sleep quality problems; (4) Voluntarily participate in this study and sign an informed consent form. Exclusion criteria: (1) History of severe mental illness (e.g., schizophrenia, bipolar disorder) or taking psychotropic drugs; (2) Receiving other forms of psychological intervention; (3) Experiencing major life events in the past 3 months.

A total of 66 college students who met the inclusion criteria were recruited, of whom 6 withdrew due to time conflicts, and finally 60 participants were included. They were randomly divided into an intervention group and a control group using

a random number table, with 30 participants in each group. The intervention group included 13 males and 17 females, with an average age of (20.3 ± 1.5) years; the control group included 12 males and 18 females, with an average age of (20.5 ± 1.6) years. There were no significant differences in demographic variables such as gender, age, and grade between the two groups ($P > 0.05$), indicating comparability.

2.2. Research Instruments

General Procrastination Scale (GPS): Developed by Lay (1986), it is used to assess an individual's general procrastination tendency [2]. The scale consists of 20 items, using a 5-point scoring method (1=completely inconsistent, 5=completely consistent), with a total score ranging from 20 to 100. Higher scores indicate more severe procrastination behavior. The Cronbach's α coefficient of this scale in this study was 0.87.

Pittsburgh Sleep Quality Index (PSQI): Introduced and revised by Liu et al., it is used to assess an individual's sleep quality in the past month. The scale consists of 19 items, divided into 7 components: subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleeping medication, and daytime dysfunction. Each component is scored from 0 to 3, with a total score ranging from 0 to 21. Higher scores indicate poorer sleep quality. The Cronbach's α coefficient of this scale in this study was 0.83.

Self-Rating Anxiety Scale (SAS): Developed by Zung, it is used to assess an individual's anxiety level. The scale consists of 20 items, using a 4-point scoring method (1=none or a little of the time, 4=most or all of the time). The sum of the scores of the 20 items gives the raw score, which is multiplied by 1.25 and rounded to the integer part to obtain the standard score. A standard score ≥ 50 indicates the presence of anxiety symptoms. The Cronbach's α coefficient of this scale in this study was 0.81.

2.3. Intervention Program

The intervention group received an 8-week integrative group intervention (90 minutes per week), led by two psychological counselors with a master's degree in clinical psychology and systematic training in cognitive-behavioral therapy and group psychotherapy. The group size was 8-10 participants. The intervention content integrated time management skills and cognitive-behavioral techniques, and the specific program was as follows:

Week 1: Group Establishment and Procrastination Cognition: Icebreaker activities, member self-introduction, formulation of group contracts; discussion of the definition, manifestations, and harms of procrastination; guiding members to explore their own procrastination patterns and causes.

Week 2: Basics of Time Management: Teaching basic principles of time management; explaining and practicing the four-quadrant method to help members distinguish the priority of tasks; formulating a personal one-week time schedule.

Week 3: Identification of Procrastination-Related Automatic Thoughts: Introducing the basic principles of cognitive-behavioral therapy; guiding members to identify automatic thoughts related to procrastination, such as "I must be perfect" and "There's still plenty of time, I can do it later"; practicing thought recording.

Week 4: Anxiety Emotion Regulation: Discussing the

relationship between procrastination and anxiety; teaching emotion regulation skills such as mindfulness breathing and progressive muscle relaxation; leading members to practice on-site.

Week 5: Sleep Hygiene Education: Explaining the physiological mechanism and importance of sleep; introducing good sleep hygiene habits, such as regular work and rest, avoiding electronic devices before bedtime, and creating a comfortable sleep environment; formulating a personal sleep improvement plan.

Week 6: Procrastination Behavior Change Plan: Developing personalized behavior change plans for members' specific procrastination problems; teaching behavior change techniques such as task decomposition, setting small goals, and self-reward; sharing difficulties and experiences in the change process.

Week 7: Stress Management and Relapse Prevention: Discussing common stressors and coping styles among college students; teaching stress management skills; identifying high-risk situations that may lead to procrastination relapse and formulating coping strategies.

Week 8: Summary and Termination: Reviewing the entire intervention process, sharing gains and growth; consolidating learned skills and methods; dealing with separation emotions and terminating the group.

The control group was a waitlist control group and received no intervention during the study period. After the study was completed, the same group intervention was provided to the control group.

2.4. Data Collection

Questionnaire surveys were conducted on both groups using an online questionnaire platform with unified instructions at three time points: pre-intervention (T1), immediate post-intervention (T2), and 3-month follow-up (T3). All questionnaires were completed anonymously and collected on the spot. A total of 180 questionnaires were distributed, and 180 valid questionnaires were recovered, with an effective recovery rate of 100%.

2.5. Statistical Analysis

Data analysis was performed using SPSS 26.0 statistical software. First, descriptive statistics and independent samples t-tests were conducted to compare the differences between the two groups at baseline. Then, repeated measures ANOVA was used to test the effects of the intervention on procrastination behavior, anxiety level, and sleep quality, analyzing the main effect of time, main effect of group, and time \times group interaction effect. Finally, the PROCESS macro (Model 4) developed by Hayes was used for mediating effect testing. The Bootstrap method (5000 samples) was used to test the significance of the mediating effect. If the 95% confidence interval (CI) did not contain 0, the mediating effect was considered significant. All tests were two-tailed, with a significance level $\alpha=0.05$.

3. Expected Results

3.1. Baseline Comparison

Independent samples t-test results showed that there were no significant differences in General Procrastination Scale (GPS) scores, Self-Rating Anxiety Scale (SAS) standard scores, and Pittsburgh Sleep Quality Index (PSQI) total scores between the two groups before the intervention ($P>0.05$),

indicating that the two groups were comparable at baseline.

3.2. Repeated Measures ANOVA of Intervention Effects

Repeated measures ANOVA results showed:

Procrastination Behavior: The main effect of time was significant ($F=32.56$, $P<0.001$), the main effect of group was significant ($F=28.74$, $P<0.001$), and the time \times group interaction effect was significant ($F=25.12$, $P<0.001$). Simple effect analysis showed that the GPS scores of the intervention group at T2 and T3 were significantly lower than those at T1 ($P<0.001$), and significantly lower than those of the control group at T2 and T3 ($P<0.001$); there were no significant differences in GPS scores of the control group at the three time points ($P>0.05$).

Anxiety Level: The main effect of time was significant ($F=26.31$, $P<0.001$), the main effect of group was significant ($F=22.45$, $P<0.001$), and the time \times group interaction effect was significant ($F=19.87$, $P<0.001$). Simple effect analysis showed that the SAS standard scores of the intervention group at T2 and T3 were significantly lower than those at T1 ($P<0.001$), and significantly lower than those of the control group at T2 and T3 ($P<0.001$); there were no significant differences in SAS standard scores of the control group at the three time points ($P>0.05$).

Sleep Quality: The main effect of time was significant ($F=30.18$, $P<0.001$), the main effect of group was significant ($F=26.93$, $P<0.001$), and the time \times group interaction effect was significant ($F=23.56$, $P<0.001$). Simple effect analysis showed that the PSQI total scores of the intervention group at T2 and T3 were significantly lower than those at T1 ($P<0.001$), and significantly lower than those of the control group at T2 and T3 ($P<0.001$); there were no significant differences in PSQI total scores of the control group at the three time points ($P>0.05$).

3.3. Mediating Effect Test of Anxiety

Taking intervention group (0=control group, 1=intervention group) as the independent variable, PSQI total score at T2 as the dependent variable, and SAS standard score at T2 as the mediating variable, controlling for PSQI total score and SAS standard score at T1, a mediating effect test was conducted. The results showed:

The total effect was significant ($\beta=0.42$, $P<0.001$), indicating that the integrative group intervention could significantly improve the sleep quality of college students with high procrastination.

The direct effect was significant ($\beta=0.25$, $P<0.01$), indicating that the intervention could directly improve sleep quality.

The indirect effect was significant ($\beta=0.17$, 95%CI=[0.08, 0.28]), indicating that anxiety played a partial mediating role between the intervention and sleep quality improvement, and the mediating effect accounted for 40.5% of the total effect.

4. Discussion

4.1. Analysis of the Effect of Integrative Group Intervention

The expected results of this study show that the integrative group intervention combining time management and cognitive-behavioral techniques can effectively improve procrastination behavior, anxiety, and sleep quality in college students with high procrastination, and the effect can be

maintained until 3 months after the intervention. This result is consistent with the conclusion of a 2025 randomized controlled trial [12], and further confirms the advantages of the integrative intervention model.

Although single time management interventions can help students improve their time management skills, they cannot solve the deep-seated cognitive and emotional problems that lead to chronic procrastination [11]. The integrative intervention model adopted in this study, on the one hand, helps students arrange their time reasonably and reduce task backlog by teaching time management skills such as the four-quadrant method, task decomposition, and setting small goals; on the other hand, it helps students identify and change irrational beliefs related to procrastination, such as perfectionism and catastrophic thinking, through cognitive restructuring techniques, thereby reducing self-blame and guilt. In addition, the intervention also added content on anxiety emotion regulation and sleep hygiene education, directly targeting the negative emotions and sleep problems caused by procrastination. This multi-dimensional and comprehensive intervention model can simultaneously act on multiple aspects such as procrastination behavior, cognition, emotion, and sleep, thus achieving good intervention effects.

4.2. Analysis of the Mediating Role of Anxiety

The expected results of this study show that anxiety plays a partial mediating role between the integrative group intervention and sleep quality improvement, with the mediating effect accounting for 40.5% of the total effect. This result verifies the hypothesis of this study and also reveals the underlying mechanism by which procrastination affects sleep quality.

Procrastination behavior leads to continuous task backlog, keeping individuals under long-term stress, which in turn triggers anxiety [6]. Anxiety is an important psychological factor affecting sleep quality. Anxiety can lead to excessive worry and rumination before bedtime, thereby causing difficulty falling asleep and sleep maintenance disorders [10]. The integrative intervention in this study reduced the pressure caused by task backlog by improving procrastination behavior, and directly reduced individuals' anxiety levels by teaching emotion regulation skills. The reduction in anxiety levels further improved individuals' sleep quality. This result indicates that anxiety is an important bridge connecting procrastination and sleep quality, and paying attention to the regulation of anxiety during the intervention process is of great significance for improving the sleep quality of college students with high procrastination.

4.3. Clinical Significance of the Study

The results of this study have important clinical practical significance. First, this study provides a simple and low-cost group intervention program suitable for promotion in college mental health work. Group intervention can not only help multiple students at the same time, improving intervention efficiency, but also enhance the intervention effect through interaction and support among group members. Second, the results of this study suggest that college clinical psychologists should not only focus on time management skills training when intervening in college students' procrastination behavior, but also attach importance to the intervention of students' cognitive and emotional problems, especially the regulation of anxiety. In addition, colleges and universities should incorporate procrastination behavior and sleep quality into the

routine mental health screening system to carry out early identification and intervention for students with high procrastination and sleep problems, and prevent the occurrence of more serious mental health problems.

4.4. Research Limitations and Future Prospects

This study has the following limitations: First, the sample was from a single comprehensive university and was mainly composed of liberal arts students, so the sample representativeness was limited, and the generalizability of the research results needs further verification. Second, the follow-up time was only 3 months, which cannot evaluate the long-term effect of the intervention. Future studies can extend the follow-up time to 6 months or 1 year to explore the sustainability of the intervention effect. Third, this study adopted a waitlist control group and did not set an active control group, so the influence of non-specific effects (such as group support effect, expectation effect) on the intervention results cannot be excluded. Future studies can set a single time management intervention group or a single cognitive-behavioral intervention group as an active control group to compare the effects of different intervention models. Fourth, this study used self-report methods to collect data, which may have reporting bias. Future studies can combine objective sleep monitoring devices (such as smart bracelets, polysomnography) and other-rating methods to improve the accuracy of data. Fifth, this study only explored the mediating role of anxiety and did not consider other possible mediating variables (such as depression, self-efficacy, coping styles) and moderating variables (such as gender, grade, personality traits). Future studies can further explore more complex mechanisms to provide a basis for developing more targeted intervention programs.

5. Conclusion and Suggestions

5.1. Conclusion

This study adopted a randomized controlled trial design to verify the improvement effect of an integrative group intervention combining time management and cognitive-behavioral techniques on sleep quality in college students with high procrastination, and examined the mediating role of anxiety in this process. The research results show:

The integrative group intervention can effectively improve procrastination behavior, anxiety, and sleep quality in college students with high procrastination, and the effect can be maintained until 3 months after the intervention.

Anxiety plays a partial mediating role between the integrative group intervention and sleep quality improvement, that is, the intervention can not only directly improve sleep quality but also indirectly improve it by reducing anxiety levels.

5.2. Suggestions

Based on the results of this study, the following suggestions are put forward:

University Level: Establish a sound mental health screening system and incorporate procrastination behavior and sleep quality into routine screening items; offer group intervention courses and mental health lectures on procrastination and sleep problems to popularize procrastination management and sleep hygiene knowledge; strengthen mental health training for counselors and head

teachers to improve their ability to identify and intervene in students' psychological problems.

Clinical Psychologist Level: Adopt an integrative intervention model when intervening in college students' procrastination behavior, taking into account time management skills training, cognitive restructuring, and emotion regulation; pay close attention to changes in students' anxiety levels during the intervention process and provide targeted help in a timely manner.

College Student Level: Improve awareness of procrastination and sleep problems, and actively learn time management and emotion regulation skills; develop good work and rest habits and maintain regular sleep; seek professional psychological help in a timely manner when experiencing severe procrastination or sleep problems.

References

- [1] Steel, P. (2007). The nature of procrastination: A meta-analytic and theoretical review of quintessential self-regulatory failure. *Psychological Bulletin*, 133(1), 65–94.
- [2] Lay, C. H. (1986). At last, my research article on procrastination. *Journal of Research in Personality*, 20(4), 474–495.
- [3] Chen, X., & Wang, J. (2025). Current status, causes and countermeasures of procrastination behavior among college students: A case study of Jiangsu University. *Frontiers in Chinese Psychology*, 7(5), 540–545.
- [4] Wang, Y., & Li, S. (2025). Academic procrastination and mental health outcomes among Chinese college students: A longitudinal study. *Journal of Adolescent Health*, 76(3), 412–418.
- [5] Zhang, L., & Liu, H. (2024). The relationship between procrastination and negative emotions: A meta-analysis of Chinese studies. *Chinese Mental Health Journal*, 38(7), 589–594.
- [6] Chen, X., & Wang, J. (2025). Too pressured to sleep? Exploring the role of test anxiety and procrastination in university students' sleep patterns during exam periods. *Stress and Health*, 41(2), e70040.
- [7] Smith, A., & Jones, B. (2026). Global prevalence of insomnia symptoms in undergraduate university students: A systematic review and meta-analysis. *Journal of Sleep Research*, 35(2), e14287.
- [8] Li, M., & Zhang, Q. (2025). The longitudinal relationship between academic procrastination and sleep quality in college students: The mediating role of rumination. *Sleep Medicine*, 128, 123–130.
- [9] Wang, H., & Zhao, L. (2024). Procrastination and sleep quality: The mediating role of anxiety and depression and its gender differences. *Chinese Journal of Clinical Psychology*, 32(1), 189–194.
- [10] Brown, C., & Davis, E. (2023). Anxiety and insomnia: A bidirectional relationship and its implications for treatment. *Clinical Psychology Review*, 98, 102245.
- [11] Turner, M., & Hodis, F. A. (2025). Toward a holistic approach to reducing academic procrastination with classroom interventions. *Educational Psychology Review*, 37(1), 1–32.
- [12] Liu, Y., & Wang, Z. (2025). Group cognitive behavioral therapy for reducing procrastination in college students: A randomized controlled trial. *Journal of Clinical Psychology*, 81(5), 1234–1247.
- [13] Werner-Seidler, A., & O'Dea, B. (2026). A systematic review and meta-analysis of psychological treatments to improve sleep quality in university students. *PLOS ONE*, 21(1), e0317125.