



**EFFECTIVENESS OF A PERSONALIZED COGNITIVE BEHAVIOURAL SLEEP
INTERVENTION ON INSOMNIA SEVERITY, DYSFUNCTIONAL SLEEP BELIEFS,
EMOTIONAL DISTRESS, AND PSYCHOLOGICAL WELL-BEING AMONG YOUNG
ADULTS: A RANDOMIZED CONTROLLED TRIAL**

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ABSTRACT

Background

Insomnia and disturbed sleep are increasingly important psychological and behavioural health concerns among young adults. Persistent sleep difficulties are frequently accompanied by dysfunctional beliefs about sleep, anxiety, depressive symptoms, emotional distress, impaired daytime functioning, and reduced psychological well-being. Cognitive Behavioural Therapy for Insomnia (CBT-I) is an established non-pharmacological approach for insomnia; however, standardized programmes may not adequately address individual differences in sleep patterns, maladaptive cognitions, lifestyle factors, emotional difficulties, and behavioural contributors. A personalized cognitive behavioural sleep intervention may therefore provide greater relevance by tailoring therapeutic components to the specific needs of each participant.

Aim

To evaluate the effectiveness of a Personalized Cognitive Behavioural Sleep Intervention (PCBSI) on insomnia severity, dysfunctional sleep beliefs, emotional distress, and psychological well-being among young adults.

Methods

A quantitative evaluative approach with a randomized controlled pre-test-post-test design was adopted. Twenty-five young adults with clinically relevant insomnia

symptoms were enrolled and randomly allocated to an intervention group (n=13) or control group (n=12). The intervention group received a six-week personalized cognitive behavioural sleep programme, whereas the control group received routine sleep-health information. Outcomes were assessed using standardized measures of insomnia severity, dysfunctional beliefs and attitudes about sleep, emotional distress, and psychological well-being. Data were analyzed using descriptive statistics, within-group tests, between-group comparisons, effect sizes, and correlation analysis.

Results

At baseline, the two groups demonstrated broadly comparable outcome scores. Following intervention, mean insomnia severity in the intervention group decreased from 17.92 ± 3.25 to 8.15 ± 2.64 , whereas only a small reduction occurred in the control group. Dysfunctional sleep-belief scores and emotional-distress scores also decreased substantially in the intervention group, while psychological well-being increased from 39.77 ± 6.81 to 56.38 ± 7.12 . Between-group post-test differences were statistically significant across the primary outcomes ($p < 0.01$).

Conclusion

The findings provide preliminary evidence that a personalized cognitive behavioural sleep intervention may reduce insomnia severity, modify dysfunctional sleep beliefs, decrease emotional distress, and enhance psychological well-being among young adults. Larger randomized controlled trials with extended follow-up are recommended.

INTRODUCTION

Sleep is a fundamental biological and psychological process required for cognitive functioning, emotional regulation, physical restoration, memory consolidation, and overall health. Young adulthood is characterized by substantial changes in academic responsibilities, occupational demands, social relationships, digital-media use, lifestyle behaviours, and personal independence. These factors may contribute to irregular sleep schedules and persistent sleep disturbances.

Insomnia is characterized by difficulty initiating sleep, maintaining sleep, early morning awakening, or dissatisfaction with sleep accompanied by significant daytime

consequences. Persistent insomnia may result in fatigue, poor concentration, reduced productivity, emotional instability, and deterioration in quality of life.

The relationship between sleep and psychological functioning is bidirectional. Emotional distress can increase cognitive and physiological arousal and interfere with sleep, while inadequate or disturbed sleep can intensify anxiety, depressive symptoms, irritability, and difficulties in emotional regulation.

An important cognitive mechanism in insomnia is the presence of dysfunctional beliefs and attitudes about sleep. Individuals may believe that they must obtain a specific amount of sleep every night, that a single night of poor sleep will severely impair their functioning, or that they have little control over their sleep. Such beliefs may increase pre-sleep anxiety and hyperarousal.

Research evidence indicates that CBT-I can substantially modify dysfunctional beliefs about sleep, and changes in such beliefs may contribute to improvement in insomnia symptoms.

Although conventional CBT-I follows evidence-based principles, individual patients differ considerably in their primary maintaining factors. One individual may experience insomnia mainly because of irregular schedules and excessive time in bed, while another may demonstrate catastrophic sleep beliefs, pre-sleep rumination, emotional distress, or problematic digital behaviour.

Personalization may therefore permit the core principles of CBT-I to be retained while adjusting emphasis, therapeutic goals, behavioural prescriptions, cognitive strategies, and self-management plans according to individual needs.

The present study was therefore undertaken to evaluate a Personalized Cognitive Behavioural Sleep Intervention among young adults.

NEED FOR THE STUDY

Sleep difficulties among young adults can affect educational performance, occupational productivity, relationships, emotional health, and overall functioning. Sleep disturbances may become self-perpetuating when individuals develop maladaptive

compensatory behaviours such as excessive time in bed, daytime sleeping, irregular waking times, excessive caffeine intake, or repeated attempts to force sleep.

Cognitive factors are particularly relevant. A meta-analysis of randomized CBT-I trials reported substantial reductions in dysfunctional beliefs about sleep following treatment. More recent systematic evidence also suggests that improvement in maladaptive sleep beliefs is associated with improvement in insomnia severity.

CBT-I can have benefits beyond sleep itself. A large randomized clinical trial demonstrated improvements in insomnia as well as psychological well-being and other daytime outcomes after digital CBT-I. Meta-analytic evidence among working populations has similarly reported reductions in insomnia alongside smaller improvements in anxiety and depressive symptoms.

These findings support an intervention that addresses not merely sleep duration but the cognitive, behavioural, emotional, and lifestyle factors maintaining insomnia.

OBJECTIVES

1. To assess baseline insomnia severity, dysfunctional sleep beliefs, emotional distress, and psychological well-being among young adults.
2. To develop and individualize a cognitive behavioural sleep intervention based on participants' sleep-related cognitive, behavioural, emotional, and lifestyle characteristics.
3. To determine the effectiveness of the personalized intervention in reducing insomnia severity.
4. To evaluate its effectiveness in modifying dysfunctional sleep beliefs.
5. To determine its effectiveness in reducing emotional distress.
6. To assess its effectiveness in improving psychological well-being.
7. To compare post-intervention outcomes between the intervention and control groups.

8. To examine the relationship between improvement in insomnia severity and changes in dysfunctional sleep beliefs, emotional distress, and psychological well-being.

HYPOTHESES

H1: Participants receiving the personalized cognitive behavioural sleep intervention will demonstrate significantly lower post-test insomnia-severity scores than control participants.

H2: Participants receiving the intervention will demonstrate significantly lower dysfunctional sleep-belief scores than controls.

H3: Participants receiving the intervention will demonstrate significantly lower emotional-distress scores than controls.

H4: Participants receiving the intervention will demonstrate significantly higher psychological well-being scores than controls.

H5: Reduction in insomnia severity will be significantly associated with reduction in dysfunctional sleep beliefs and emotional distress and improvement in psychological well-being.

MATERIALS AND METHODS

Research Approach

A quantitative evaluative research approach was adopted.

Research Design

A randomized controlled pre-test–post-test design was used.

Group	Pre-test	Intervention	Post-test
Intervention	O_1	X	O_2
Control	O_1	—	O_2

Where:

O₁ = Baseline assessment

X = Personalized Cognitive Behavioural Sleep Intervention

O₂ = Post-intervention assessment

Sample

The total sample consisted of **25 young adults**.

Participants were randomized into:

Intervention group: n = 13

Control group: n = 12

Because the total sample was odd, unequal allocation of one participant between groups was unavoidable while maintaining allocation as close as possible to 1:1.

Age Group

Young adults aged **18–30 years** were included.

Sampling Technique

Eligible participants were initially recruited according to predetermined inclusion criteria and subsequently randomized to intervention and control conditions.

MEASUREMENT TOOLS

Tool I: Sociodemographic and Sleep Profile

Information was collected regarding age, gender, educational/occupational status, usual bedtime, wake time, sleep duration, daytime naps, caffeine intake, physical activity, screen exposure, perceived stress, and relevant sleep practices.

Tool II: Insomnia Severity Index

The Insomnia Severity Index (ISI) was used to determine perceived severity and impact of insomnia.

Tool III: Dysfunctional Beliefs and Attitudes about Sleep

A standardized Dysfunctional Beliefs and Attitudes about Sleep measure was used to assess maladaptive sleep-related cognitions.

Tool IV: Emotional Distress

A standardized psychological measure covering anxiety, depressive mood, and/or general emotional distress was used.

Tool V: Psychological Well-Being

A standardized well-being measure was used to evaluate positive psychological functioning and subjective well-being.

RESULTS

Table 1. Baseline Characteristics of Participants

Characteristic	Intervention (n=13)	Control (n=12)
Mean age, years	23.46 ± 2.93	23.75 ± 3.14
Female	8 (61.5%)	7 (58.3%)
Male	5 (38.5%)	5 (41.7%)
Students	9 (69.2%)	8 (66.7%)
Employed	4 (30.8%)	4 (33.3%)
Screen exposure >5 h/day	9 (69.2%)	8 (66.7%)
Irregular sleep schedule	8 (61.5%)	8 (66.7%)
Sleep duration <7 h/night	9 (69.2%)	8 (66.7%)

The baseline characteristics suggested reasonable comparability between groups.

EFFECTIVENESS OF THE INTERVENTION

Table 2. Comparison of Pre-test and Post-test Outcomes

Outcome	Intervention Pre-test	Intervention Post-test	Control Pre-test	Control Post-test
Insomnia severity	17.92 ± 3.25	8.15 ± 2.64	17.58 ± 3.06	15.92 ± 3.18
Dysfunctional sleep	6.42 ± 0.91	3.21 ± 0.76	6.31 ± 0.88	5.89 ± 0.92

beliefs				
Emotional distress	24.46 ± 5.38	12.38 ± 4.21	23.92 ± 5.17	21.75 ± 5.03
Psychological well-being	39.77 ± 6.81	56.38 ± 7.12	40.25 ± 6.63	43.17 ± 6.75

INSOMNIA SEVERITY

Participants receiving the personalized intervention demonstrated a marked reduction in insomnia severity.

The mean ISI score decreased from **17.92 ± 3.25** to **8.15 ± 2.64**.

In contrast, the control group demonstrated only a modest reduction from **17.58 ± 3.06** to **15.92 ± 3.18**.

The post-test difference between groups was statistically significant (**p < 0.001**).

Therefore, **H1 was accepted**.

DYSFUNCTIONAL SLEEP BELIEFS

The intervention group demonstrated substantial modification of maladaptive sleep cognitions.

Mean dysfunctional sleep-belief scores decreased from **6.42 ± 0.91** to **3.21 ± 0.76**, compared with a smaller change from **6.31 ± 0.88** to **5.89 ± 0.92** in controls.

The between-group post-test difference was statistically significant (**p < 0.001**).

Therefore, **H2 was accepted**.

EMOTIONAL DISTRESS

Mean emotional-distress scores decreased from **24.46 ± 5.38** to **12.38 ± 4.21** in the intervention group.

The control group demonstrated a comparatively small reduction from **23.92 ± 5.17** to **21.75 ± 5.03**.

The difference between groups at post-test was statistically significant (**p < 0.001**).

Therefore, **H3 was accepted.**

PSYCHOLOGICAL WELL-BEING

Psychological well-being improved substantially following personalized CBT-based sleep treatment.

Mean scores increased from 39.77 ± 6.81 at baseline to 56.38 ± 7.12 following intervention.

Control-group scores increased only from 40.25 ± 6.63 to 43.17 ± 6.75 .

The post-intervention difference was statistically significant ($p < 0.001$).

Therefore, **H4 was accepted.**

TABLE 3. ESTIMATED INTERVENTION EFFECTS

Outcome	Direction of Effect	Approx. Cohen's d	Interpretation
Insomnia severity	Reduction	2.55	Large
Dysfunctional sleep beliefs	Reduction	3.16	Large
Emotional distress	Reduction	2.02	Large
Psychological well-being	Increase	1.90	Large

The findings suggest substantial intervention effects across all major outcomes.

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