

Integrative Therapy for Insomnia: A Pilot Study to Test an Extended CBT-I Program

Jacobien Kamp^{1*}, Mineke K. Viaene², Hilde Verhoeven³

¹Psychology Department, University of Amsterdam, Amsterdam, Netherlands

²General Hospital, Geel, Belgium

³Independant Psychologist, Geel, Belgium

Email: *jacobien.kamp@gmail.com, mineke.viaene@ziekenhuisgeel.be, verhoeven.hilde@telenet.be

How to cite this paper: Kamp, J., Viaene, M.K. and Verhoeven, H. (2024) Integrative Therapy for Insomnia: A Pilot Study to Test an Extended CBT-I Program. *Open Journal of Therapy and Rehabilitation*, 12, 301-315. <https://doi.org/10.4236/ojtr.2024.124023>

Received: August 31, 2024

Accepted: October 6, 2024

Published: October 9, 2024

Copyright © 2024 by author(s) and Scientific Research Publishing Inc. This work is licensed under the Creative Commons Attribution International License (CC BY 4.0). <http://creativecommons.org/licenses/by/4.0/>



Open Access

Abstract

Research background and Objectives: Cognitive Behavioral Therapy for Insomnia (CBT-I) is recognized as the preferred non-pharmaceutical treatment for Insomnia. This pilot study aims to test the efficacy of an extended version of CBT-I called Integrative Therapy for Insomnia (IT-I). The traditional CBT-I is complemented with exercises that are expected to enhance relearning to sleep by providing different stimuli, and access options for the retrieval and application of the acquired information, cognition, and skills. **Method:** The efficacy of the IT-I is measured by comparing the participants' scores on the Insomnia Severity Index at baseline and post-treatment. In total 29 people, with a wide range of ages, participated in the 8 sessions' treatment of one hour 45 minutes per session, in mixed groups of age, gender, and primary or comorbid insomnia. **Results:** Comparing the ISI baseline and post-treatment scores, results show a mean improvement of 7.2 points and a $p < 0.01$ as evidence of efficacy. Due to the limited number of male participants, conclusions related to gender differences could not be made while age and insomnia severity improvement shows a moderate negative correlation $r = -0.43$. **Conclusions:** The integration of exercises that generate sensory-motor stimuli, and address the mirror neuron system fitting with the Mental Contrasting as a metacognitive strategy seems to facilitate re-learning to sleep in cases of primary insomnia as well as for comorbid insomnia. Further studies will be needed to arrive at more firm conclusions.

Keywords

Cognitive Behavioral Therapy for Insomnia, Primary Insomnia, Comorbid Insomnia

1. Introduction

In this paper, we present and discuss the results of a pilot study on the efficacy of

Integrative Therapy for Insomnia (IT-I), an extended version of a usual CBT-I. Meta-reviews by some scholars support our view that for a number of cases of chronic insomnia, prolonged treatment may be beneficial [1]-[4] (Table 1).

Table 1. Supportive studies, relevant to the development of IT-I.

Author (year), Title	Focus area	Support for our extended program
Hofman et al. (2012) [3] <i>The efficacy of cognitive behavioral therapy: A review of meta-analyses</i>	“Despite these weaknesses in some areas, it is clear that the evidence-base of CBT is enormous”.	Evidence for the efficacy of CBT for people with insomnia, however not equally strong evidence for different comorbid insomnia.
Trauer et al. (2015) [1] <i>Cognitive behavioral therapy for chronic insomnia: A systematic review and meta-analysis</i>	“Our meta-analysis shows CBT-i to be a highly effective treatment for noncomorbid chronic insomnia, producing clinically meaningful responses”.	Strong support to use CBT-I as intervention for noncomorbid insomnia.
Sanchez-Ortuño et al. (2012) [4] <i>Cognitive-behavioral therapy for the management of insomnia comorbid with mental disorders</i>	“(..) Cognitive-behavioral therapy (CBT) is a well-established and efficacious treatment for insomnia. (..) it is possible that patients with more complex disorders may need a more prolonged CBT-dosing schedule”.	The application of CBT-I for people with primary insomnia and comorbid insomnia, however with a need for a more prolonged program.

Drawing on scholars in grounded cognition [5]-[8] and educational psychology [9] [10], it can be expected that by providing different routes for learning, followed by embedding information and experiences, the retrieval of new behavior and cognitions is facilitated (Table 2). This approach is expected to be effective in primary insomnia but could also meet the need in cases of comorbid insomnia (Table 2). The authors developed a program and protocol that contains the usual elements of the CBT-I [1] to which they added different approaches and methods of delivery from other psychotherapeutic disciplines. The resulting therapy is called Integrative Therapy for Insomnia (IT-I). The pilot study aims to test the efficacy of the IT-I, which is expected to:

- 1) Enhance learning by supporting the different learning styles of participants.
- 2) Provide access options for the retrieval and application of the acquired information, cognition, and skills.

For details on the offered treatment program see Table A2 and Figure 1.

Table 2. Supportive studies relevant to the extensions of the protocol.

Author, year, Title	Authors’ Conclusion	Relevance for our extended program
[7] Barsalou (2010) <i>Grounded Cognition: Past, Present, and Future</i>	“(..) sensory-motor variables affect diverse tasks associated with perception, action, memory, knowledge, language, and thought, implicating the brain’s modal systems throughout cognition”.	Feeds the hypothesis that exercises addressing sensory-motor experiences will support learning and retrieval of knowledge and abilities.

Continued

[8] Bianchi et al. (2024) <i>Grounded Cognition in Perceptual Experience</i>	“(..) a multifaceted reflection on the relevance of perceptual experience in affecting and modeling various aspects of cognitive performance”.	Feeds the hypothesis that cognitive performance is enhanced by multi-perception experiences.
[9] Andrä et al. (2020) <i>Learning Foreign Language Vocabulary with Gestures and Pictures Enhances Vocabulary Memory for Several Months Post-Learning in Eight-Year-Old School Children</i>	“(..) multisensory and sensorimotor enrichment may enhance memory by grounding the remembered material in multisensory and sensorimotor experiences”.	Feeds the hypothesis that a variety of learning strategies enhances memorization of information.
[10] Mathias et al. (2021) <i>Visual Sensory Cortices Causally Contribute to Auditory Word Recognition following Sensorimotor-Enriched Vocabulary Training</i>	“Learning by doing strategies that utilize complementary information (“enrichment”) such as gestures have been shown to optimize learning outcomes in several domains (..)”.	Feeds the hypothesis that a variety of learning strategies offers access to information for different learning styles.
[11] Oettingen (2012) <i>Future thought and behavior change.</i>	“(..) teaching mental contrasting as a metacognitive strategy, by itself or in combination with implementation intentions (MCII), may be used to help people self-regulate their behaviour change”.	The cognitive dissonance between the desired future and current reality energizes the change and functions as motivational mediator. Implementation intentions such as: If..., then. make it practical

2. Methods

2.1. Traditional CBT-I

Cognitive Behavioral Therapy for Insomnia (CBT-I) is the internationally preferred non-pharmacological therapy for the treatment of insomnia [2]. Traditional protocols for CBT-I often contain five main elements, as detailed below (Table 3).

Table 3. Elements in current CBT-I protocol.

Elements	Content e.g.
Sleep Education	Sleep/wake cycle, rhythms (homeostasis, circadian) the influence of “Zeitgebers”
Sleep Hygiene	Food, activities, conditions
Behavioral Adaptation	Time in bed, bed restriction
Cognitive Reframing	Recognize, restructure dysfunctional thinking
Relaxation	Breathing, progressive muscle relaxation, mindfulness

2.2. The IT-I Protocol

In our work, we noticed that participants frequently reported difficulties in putting the cognitive aspects of CBT-I into practice, and we proposed that people

would benefit by adding specific learning paths to the valuable components of the usual CBT-I program.

The IT-I program has been built on the usual CBT-I elements [1] and extends it with elements of an integrative and systemic approach. An overview of the program per session is included in Table A2. Figure 1 shows the major behavioral measures and cognitive techniques as program elements that act upon the participant's disruptive behavior and disruptive arousal. Behavior and cognition together influence the two processes that shape an adequate sleep/wake cycle [5]. These two processes work together and mutually influence each other and prepare a person for sleep or wake: The homeostatic sleep drive regulates the internal need for sleep and the circadian system acts as a master clock, following sunrise and sunset, wherever on earth one may be. In Figure 1, the extensions are printed in Bold & *Italic*.

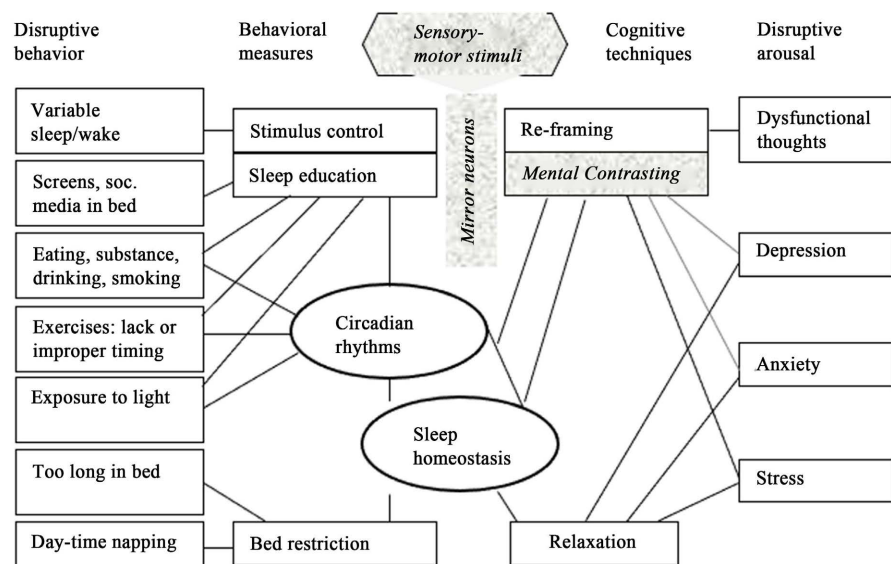


Figure 1. Measures and techniques addressing behavior and arousal.

It is expected that the extension with exercises, including sensory-motor stimuli, addressing the mirror neuron system, and Mental Contrasting with Implementation Intentions (MCII), will create opportunities to relearn sleeping. Some examples of exercises are briefly described in Table 4.

Table 4. Examples of exercises.

Exercises supporting MCII:

1) *The meaning of sleep from six angles*

Taking different positions in the room, the participants are invited to imagine six different meanings of sleep and select the desired one.

2) *Embrace your desired sleep*

While virtually being in bed participant are invited to exchange a hindering image of their sleep for the desired one.

Continued

Exercise supporting sleep hygiene and education:

1) *Cross the line*

Statements to agree or disagree with are presented and participants are invited to physically cross a line attached to the floor.

Feelings are to be connected to each step.

Exercise supporting cognitive reframing:

1) *From dysfunctional to action-oriented*

Colored A4 sheets are used to physically step on and away from a dysfunctional thought to an action-oriented helping thought while passing the triggering situation.

Feelings are to be connected to each step.

To help participants regulate their behavioral and cognitive change, Mental Contrasting with Implementation Intentions (MCII) [11] was introduced in the program. Mental contrasting is a way of thinking about a future desired situation that contrasts with the current reality. It includes cognitive, motivational, and neural mediators. The introduction of sensory-motor stimuli within the MCII approach activates the mirror neuron system [12]. Sensory-motor stimuli encompass physical movements and visual, auditory, smell, touch, and proprioceptive inputs. The effect of mirror neurons comes through participating in exercises, but also when observing exercises and accompanying emotions are observed when performed by a facilitator or other participants. Repetition of one's own practices and observation of others' performance strengthens the neural pathways and helps to develop an automatic stimulus-response pattern [12] [13]. This type of learning is coordinated in an interplay of the mirror neuron system and brain networks [14]. Together the different routes and access points to embedded information and experiences facilitate the application and thereby initiate or support change. Another extension to the program is the exercise of learning to handle nightmares through Imagery Rehearsal [6]. It starts with first writing the nightmare, changing it by adapting the participant's role and position in the story, and learning the new version by heart.

Furthermore, the program entails various relaxation exercises such as a focus on breathing, progressive muscle relaxation, virtual relaxation, and mindfulness. Participants initially participate in all types of relaxation and practice them daily at home to finally choose their preferred method. It is stressed that frequent exercise is required to be able to apply a technique automatically in stressful circumstances. It can be helpful for some to add a (virtual) image, scent, or motor action such as caressing a cuddly toy or fresh pillow.

2.3. Questionnaires

To evaluate the efficacy of this IT-I program a qualitative multi-method was used: the program was preceded and concluded, baseline and post-treatment, by interviews and scoring on the Insomnia Severity Index (ISI). The ISI is a validated

questionnaire used to measure the severity of insomnia at baseline and at the end of the intervention [15]. The interview at baseline provided context information, history of sleep, information about comorbid conditions, and the use of sleep medication. In the post-treatment session, the participants reflected on the learning process, the outcome, and the plan to anchor the results. A post-treatment inventory was emailed 3 months after the end of the program to gather information on the participants' subjective sleep perception. This inventory was replied to by 19 participants. This study did not collect information on other health management or evaluations participants underwent during the treatment.

For analysis and interpretation of the obtained ISI scores, we refer to Morin *et al.* [16] (Table 5).

Table 5. ISI score interpretation [16].

Score 0 - 7: No insomnia
Score 8 - 14: Sub-threshold insomnia
Score 15 - 21: Moderate insomnia
Score 22 - 28: Severe insomnia

Building on the categories developed by Morin *et al.* [16], a cut-off score of 10 points was used, which is the proposed score for a population-based sample. To conclude on the clinical effect of the therapy, a change of >7 was considered significant [16] [17]. At the end of session 1 the participants were given the assignment to use a sleep/wake diary for at least for two weeks to picture their daily sleep/wake pattern. Additionally, their subjective assessment of their sleep quality, "How do you feel the day after" could be indicated by selecting one out of three emojis. Participants were instructed to fill the diary between 30 - 60' after awakening to avoid the effect of morning inertia. Building on the available information such as Sleep Onset Latency (SOL), Time In Bed (TIB), and Wake After Sleep Onset (WASO) provided by the participants, each of them received dedicated advice to adapt their pattern including the moment to go to sleep, to get out of bed, and bed restriction. The use of the sleep diary was continued so long as the sleep was not satisfactory, which differed per person.

2.4. Participants

Inclusion in the treatment was based on an application to a federally funded convention for specialized psychological treatment. The convention fits the federal objective to avoid pharmaceutical treatment and lowers the threshold for participation in non-pharmaceutical treatment, by making this affordable. The convention rules include that:

- Participants are of adult age,
- Groups must have a minimum of four participants,
- Sessions have a minimum duration of 90 minutes each.

Figure 2 shows the procedure from start to finish, including the participation screening. The therapy was delivered by three therapists, two psychologists, and one medical doctor-somnologist in the period from Q4 2022 to Q2 2024.

All involved participants consented by a written statement to have their data used for this study purpose.

The Process from start to finish

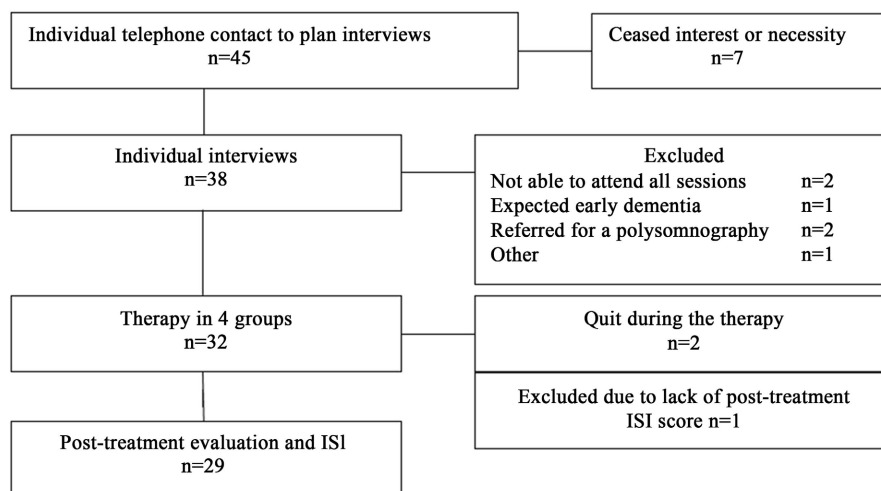


Figure 2. The process, screening followed by the therapy and post-treatment evaluation.

3. Results and Analysis

ISI-Scores

Table 6 shows the participants, gender, age, and medication. A total of 18 people were taking non-sleep-specific medication which points to comorbid insomnia, e.g., depression, psychosis, and chronic pain. The diagnoses of comorbidity were obtained with informed consent from their medical records. Of the 32 people who started the therapy, 29 finished the complete intervention program with ISI scores.

Table 6. Participants, age, and medication post-treatment.

Gender	Age		Sleep medication				Other or additional medication		
	M	Range	None	Benzo.	Hypnotic	Melatonin	Anti-depr.*	Anti-psych.**	Other
F: n = 22	49	-24 to +25	6	8	2	2	10	5	2
M: n = 7	53	-13 to +23	3	3		1	1		

The below graph (**Figure 3**) shows the ISI scores for the 29 participants, in blue at baseline before treatment and red at post-treatment. Given the limited number of male participants in the groups (n = 7) it was decided to refrain from gender-specific analysis.

The clinical significance of the observed change in scores is defined as “responsive to treatment” if a change from baseline to post-treatment is more than 7

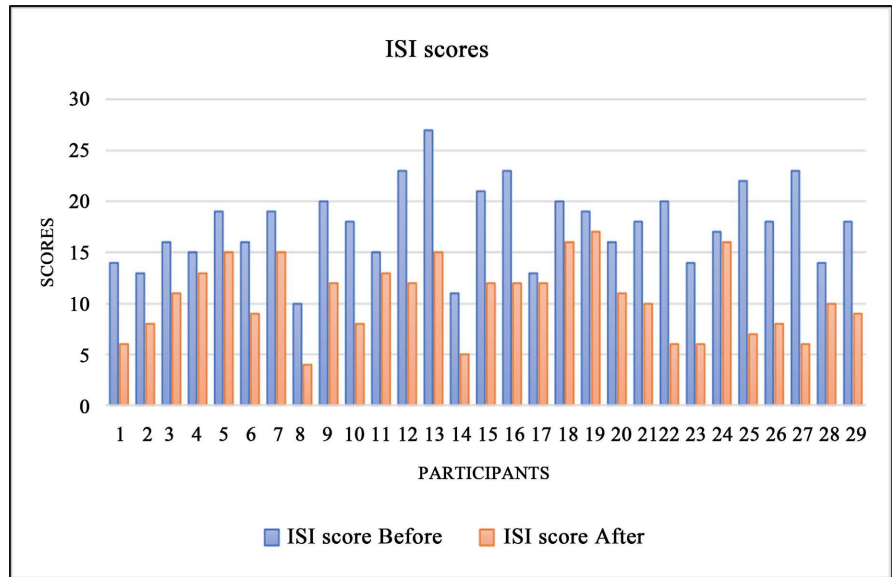


Figure 3. The ISI scores at baseline and post-treatment.

Points [16] [17]. In our study, this was realized in 14 cases. Moreover, if an intervention leads to the final total score of <8 on the ISI, the participant is not suffering from insomnia [16] and in case of comorbid insomnia with substance addiction the participant is considered to be in complete remission [16] [17]. After the therapy, 7 participants arrived at a score < 8. From the initial 5 severe cases, 1 participant moved to moderate, 2 improved to sub-threshold level and 2 realized full remission (Figure 4).

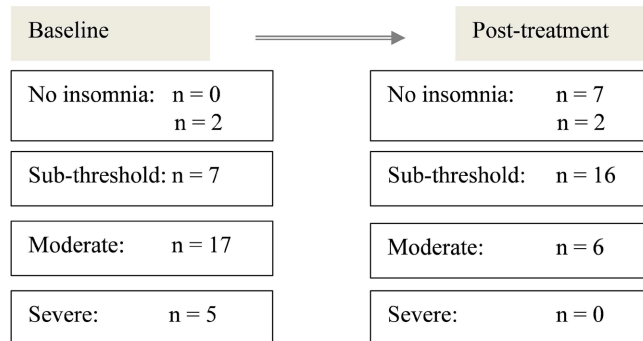


Figure 4. The ISI scores at baseline and post-treatment per severity category.

To support clinical significance the obtained data were used for some basic statistical calculations on significance.

Table 7. Calculations.

	Baseline	Post-treatment	Improvement
Mean	17.7	10.5	7.2

Continued

Median	18	11
SD	3.94	3.67
Score Range	10 - 27	4 - 17

Table 7 shows the means at baseline and post-treatment, resulting in an average improvement in $n = 29$ of 7.2 points. The paired t-test including the two measurement sets, results in $t = 8.08$ and a p -value of $8.9E-10$ or $p < 0.01$. Pearson's correlation calculation shows a moderate negative correlation of $r = -0.43$ between age and the change of ISI results before/after treatment. This correlation could suggest that older people might benefit less from the therapy as was also concluded by Montgomery & Dennis in a Systematic Review [18].

A summary of participants' statements ($n = 18$) expressed after the therapy illustrates the appreciation for the program, a greater subjective sleep satisfaction, a decrease in the use of sleep medication, and an experience of improved functioning (**Table A1**).

4. Discussion

For a start, some scholars suggest that the traditional CBT-I may not be equally effective for both primary insomnia and comorbid insomnia and may require a prolonged version in comorbid situations [1] [3] [4] while Van Straten *et al.* suggest robust effects in multi-character insomnia groups. In the present study on the efficacy of the IT-I, post-treatment information on medication usage which could indicate a comorbid depression, anxiety, or chronic pain condition was not systematically obtained. Nevertheless, the inclusion of participants with comorbid insomnia did not appear to rebut the clinical or statistical evidence supporting the treatment's efficacy.

A limitation of the present study is the absence of objective measures such as polysomnography or actigraphy. Quoting Claydon *et al.* [19], "Sleep quality is a complex concept with no consensus definition but can be generally understood as sleep satisfaction, based on both objective and subjective components of sleep". The results of the present study were derived from qualitative information obtained during the intake and exit interviews, as well as ISI scores at baseline, and the end of the therapy. These subjective results are supported by participants' statements expressed in the final evaluation as well as in a follow-up correspondence > 3 months post-treatment (**Table A1**). Although objective measurements are lacking, subjective metrics when compared to Polysomnography and Actigraphy are seen to have their value within a clinical context [17] [20].

To build on our findings and arrive at more powerful results, future studies on the efficacy of the IT-I compared to the traditional CBT-I, could benefit from adding some dedicated, not necessarily objective measurements. Building on the present study some suggestions about measurements can be useful. Firstly, the intake interview could be more powerful with the use of SCID, the questionnaire on

insomnia appended to the DSM-IV. Secondly, baseline and post-treatment measurements could include the ISI complemented with the DBASS-16 [21] to measure the degree of dysfunctional beliefs and the DASS-21 [22] to measure the occurrence of depression, anxiety, and stress. Additionally, structured intermediate use of the sleep diary would add data on the change in sleep efficiency, onset latency, and nightly awakening. The results of each of the measurements could serve to define the significance of results, correlations, or relationships between variables. Another limitation is that the present study did not control for covariates which can confound the effect of other variables. The first reason is the small number of male participants ($n = 7$), which does not allow for conclusions about gender differences in the efficacy of the intervention. Additionally, demographics such as marital status, socio-economic and employment status were not systematically collected and analyzed.

To determine the efficacy of a new intervention without comparing it to a control group sets limitations on conclusions about efficacy. Recent research advocates for an aggregated N-of-1 design, which offers advantages such as reduced sample size and costs while delivering robust outcomes [22] [23]. The N-of-1 approach focuses on the individual patient as its own control, using extensive data points at baseline, during treatment, and post-intervention. This design could be considered for future studies when a control group is lacking.

5. Conclusions

This pilot study aimed to evaluate the efficacy of the Integrative Therapy for Insomnia (IT-I), an extended cognitive-behavioral intervention for insomnia targeting both primary insomnia and comorbid insomnia. The extended protocol was designed to enhance relearning sleep by providing supplementary ways of learning for overcoming problems with cognitive learning. In contrast to the traditional CBT-I that focuses in the first place on bed restriction, the IT-I emphasizes the use of sensory-motor stimuli and the mirror neuron system to reinforce sleep relearning. Results show a potentially significant improvement between baseline and post-treatment ($p < 0.01$) with ISI scores showing an average reduction of 7.2 points and a range from 1 - 17 points. This low p -value, < 0.01 , indicates a meaningful difference between the ISI scores underscoring the clinical significance of the intervention, which is further corroborated by participants' testimonies (**Table A1**).

Despite the promising result, it could not directly be compared with the efficacy of traditional CBT-I programs, due to a lack of standardized measures across studies. Harvey *et al.* [23] compare the efficacy of Behavioral Therapy (BT), Cognitive Therapy (CT), and CBT and suggest the latest as the preferred treatment. Others apply an experimental design including and analyzing results on a selection of specific dependent variables, such as sleep onset latency, number of awakenings or sleep efficiency [24]. Recent reviews or meta-analyses compare different ways of delivery such as in-person, online, and digital means [25] [26] or even compare

different ways of delivery on the probability of being effective including pharmacological solutions [27] [28].

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

References

- [1] Trauer, J.M., Qian, M.Y., Doyle, J.S., Rajaratnam, S.M.W. and Cunnington, D. (2015) Cognitive Behavioral Therapy for Chronic Insomnia: A Systematic Review and Meta-Analysis. *Annals of Internal Medicine*, **163**, 191-204. <https://doi.org/10.7326/m14-2841>
- [2] Riemann, D., Espie, C.A., Altena, E., Arnardottir, E.S., Baglioni, C., Bassetti, C.L.A., et al. (2023) The European Insomnia Guideline: An Update on the Diagnosis and Treatment of Insomnia 2023. *Journal of Sleep Research*, **32**, e14035.
- [3] Hofmann, S.G., Asnaani, A., Vonk, I.J.J., Sawyer, A.T. and Fang, A. (2012) The Efficacy of Cognitive Behavioral Therapy: A Review of Meta-Analyses. *Cognitive Therapy and Research*, **36**, 427-440. <https://doi.org/10.1007/s10608-012-9476-1>
- [4] Sánchez-Ortuño, M.M. and Edinger, J.D. (2012) Cognitive-behavioral Therapy for the Management of Insomnia Comorbid with Mental Disorders. *Current Psychiatry Reports*, **14**, 519-528. <https://doi.org/10.1007/s11920-012-0312-9>
- [5] Borbély, A. and Tobler, I. (2023) The Two-Process Model: Origin of Its Concepts and Their Implications. *Clinical and Translational Neuroscience*, **8**, Article 5. <https://doi.org/10.3390/ctn8010005>
- [6] Lancee, J., Spoomaker, V.I. and van den Bout, J. (2010) Cognitive-Behavioral Self-Help Treatment for Nightmares: A Randomized Controlled Trial. *Psychotherapy and Psychosomatics*, **79**, 371-377. <https://doi.org/10.1159/000320894>
- [7] Barsalou, L.W. (2010) Grounded Cognition: Past, Present, and Future. *Topics in Cognitive Science*, **2**, 716-724. <https://doi.org/10.1111/j.1756-8765.2010.01115.x>
- [8] Bianchi, I., Actis-Grosso, R. and Ball, L.J. (2024) Grounding Cognition in Perceptual Experience. *Journal of Intelligence*, **12**, Article 66. <https://doi.org/10.3390/jintelligence12070066>
- [9] Andrä, C., Mathias, B., Schwager, A., Macedonia, M. and von Kriegstein, K. (2020) Learning Foreign Language Vocabulary with Gestures and Pictures Enhances Vocabulary Memory for Several Months Post-Learning in Eight-Year-Old School Children. *Educational Psychology Review*, **32**, 815-850. <https://doi.org/10.1007/s10648-020-09527-z>
- [10] Mathias, B., Sureth, L., Hartwigsen, G., Macedonia, M., Mayer, K.M. and von Kriegstein, K. (2020) Visual Sensory Cortices Causally Contribute to Auditory Word Recognition Following Sensorimotor-Enriched Vocabulary Training. *Cerebral Cortex*, **31**, 513-528. <https://doi.org/10.1093/cercor/bhaa240>
- [11] Oettingen, G. (2012) Future Thought and Behaviour Change. *European Review of Social Psychology*, **23**, 1-63. <https://doi.org/10.1080/10463283.2011.643698>
- [12] Gallese, V. (2011) From Mirror Neurons to Embodied Simulation: A New Neuroscientific Perspective on Intersubjectivity. *European Psychiatry*, **26**, 2127-2127. [https://doi.org/10.1016/s0924-9338\(11\)73830-5](https://doi.org/10.1016/s0924-9338(11)73830-5)
- [13] Mulder, T. (2007) Motor Imagery and Action Observation: Cognitive Tools for Rehabilitation. *Journal of Neural Transmission*, **114**, 1265-1278.

- <https://doi.org/10.1007/s00702-007-0763-z>
- [14] Ramsey, R., Kaplan, D.M. and Cross, E.S. (2021) Watch and Learn: The Cognitive Neuroscience of Learning from Others' Actions. *Trends in Neurosciences*, **44**, 478-491. <https://doi.org/10.1016/j.tins.2021.01.007>
- [15] Bastien, C.H., Morin, C.M., Ouellet, M., Blais, F.C. and Bouchard, S. (2004) Cognitive-Behavioral Therapy for Insomnia: Comparison of Individual Therapy, Group Therapy, and Telephone Consultations. *Journal of Consulting and Clinical Psychology*, **72**, 653-659. <https://doi.org/10.1037/0022-006x.72.4.653>
- [16] Morin, C.M., Belleville, G., Bélanger, L. and Ivers, H. (2011) The Insomnia Severity Index: Psychometric Indicators to Detect Insomnia Cases and Evaluate Treatment Response. *Sleep*, **34**, 601-608. <https://doi.org/10.1093/sleep/34.5.601>
- [17] Arnedt, J.T., Conroy, D.A., Armitage, R. and Brower, K.J. (2011) Cognitive-Behavioral Therapy for Insomnia in Alcohol Dependent Patients: A Randomized Controlled Pilot Trial. *Behaviour Research and Therapy*, **49**, 227-233. <https://doi.org/10.1016/j.brat.2011.02.003>
- [18] Montgomery, P. and Dennis, J.A. (2003) Cognitive Behavioural Interventions for Sleep Problems in Adults Aged 60+. *Cochrane Database of Systematic Reviews*, No. 2, CD003161. <https://doi.org/10.1002/14651858.cd003161>
- [19] Claydon, E., Kahwash, J., Lilly, C.L., Alamir, Y. and Zullig, K.J. (2023) Subjective Sleep Quality, Caffeine, and Dieting Behaviors among University-Attending Young Adults. *Nature and Science of Sleep*, **15**, 737-747. <https://doi.org/10.2147/nss.s420568>
- [20] Conroy, D.A., Todd Arnedt, J., Brower, K.J., Strobbe, S., Consens, F., Hoffmann, R., et al. (2006) Perception of Sleep in Recovering Alcohol-Dependent Patients with Insomnia: Relationship with Future Drinking. *Alcoholism: Clinical and Experimental Research*, **30**, 1992-1999. <https://doi.org/10.1111/j.1530-0277.2006.00245.x>
- [21] Morin, C.M., Vallières, A. and Ivers, H. (2007) Dysfunctional Beliefs and Attitudes about Sleep (DBAS): Validation of a Brief Version (DBAS-16). *Sleep*, **30**, 1547-1554. <https://doi.org/10.1093/sleep/30.11.1547>
- [22] Scholten, S., Velten, J., Bieda, A., Zhang, X.C. and Margraf, J. (2017) Testing Measurement Invariance of the Depression, Anxiety, and Stress Scales (DASS-21) across Four Countries. *Psychological Assessment*, **29**, 1376-1390. <https://doi.org/10.1037/pas0000440>
- [23] Harvey, A.G., Bélanger, L., Talbot, L., Eidelman, P., Beaulieu-Bonneau, S., Fortier-Brochu, É., et al. (2014) Comparative Efficacy of Behavior Therapy, Cognitive Therapy, and Cognitive Behavior Therapy for Chronic Insomnia: A Randomized Controlled Trial. *Journal of Consulting and Clinical Psychology*, **82**, 670-683. <https://doi.org/10.1037/a0036606>
- [24] Morin, C.M., Bootzin, R.R., Buysse, D.J., Edinger, J.D., Espie, C.A. and Lichstein, K.L. (2006) Psychological and Behavioral Treatment of Insomnia: Update of the Recent Evidence (1998-2004). *Sleep*, **29**, 1398-1414. <https://doi.org/10.1093/sleep/29.11.1398>
- [25] Drager, L.F., Assis, M., Bacelar, A.F.R., Poyares, D.L.R., Conway, S.G., Pires, G.N., et al. (2023) 2023 Guidelines on the Diagnosis and Treatment of Insomnia in Adults—Brazilian Sleep Association. *Sleep Science*, **16**, 507-549. <https://doi.org/10.1055/s-0043-1776281>
- [26] Lancee, J., van Straten, A., Morina, N., Kaldo, V. and Kamphuis, J.H. (2016) Guided Online or Face-To-Face Cognitive Behavioral Treatment for Insomnia: A Randomized Wait-List Controlled Trial. *Sleep*, **39**, 183-191. <https://doi.org/10.5665/sleep.5344>

- [27] Forma, F., Pratiwadi, R., El-Moustaid, F., Smith, N., Thorndike, F. and Velez, F. (2022) Network Meta-Analysis Comparing the Effectiveness of a Prescription Digital Therapeutic for Chronic Insomnia to Medications and Face-To-Face Cognitive Behavioral Therapy in Adults. *Current Medical Research and Opinion*, **38**, 1727-1738. <https://doi.org/10.1080/03007995.2022.2108616>
- [28] van Straten, A., van der Zwerde, T., Kleiboer, A., Cuijpers, P., Morin, C.M. and Lancee, J. (2018) Cognitive and Behavioral Therapies in the Treatment of Insomnia: A Meta-Analysis. *Sleep Medicine Reviews*, **38**, 3-16. <https://doi.org/10.1016/j.smrv.2017.02.001>

Appendices

Participants' post-treatment testimonies (**Table A1**).

Table A1. Participants' testimonies.

M/F	Brief testimonies from participants	#Months after the start of therapy
F	Stopped trazodone, very grateful for all I have learned.	10
F	Very grateful for the therapy and improvement of my sleep. More energy during daytime.	21
F	My sleep quality improved a lot, a minimum 7 hours/night. Very grateful.	18
F	Much faster falling asleep, could decrease sleep medication considerably despite stress and difficulties.	21
F	Don't exactly remember the medication, stopped Zolpidem.	18
M	My sleep is back to normal and good again.	6
M	I have been drinking a lot and took Benzo's. This stopped. Also, DMII is gone.	10
F	I'm well and my sleep improved a lot, stopped medication.	6
F	80% of the nights I sleep like a baby, my sleep improved a lot.	18
F	Stopped taking sleep med. and anti-depressant. Back to work for 100%.	10
F	My sleep pattern improved a lot, No worries about sleep anymore and stopped medication.	21
F	My nights are much better and quieter, no nightmares anymore.	10
M	Thank you for the support and advice, it really helped me. Will continue to decrease medication till none.	10
M	Very helpful program: the relaxation exercises, handling dysfunctional thoughts, what to do and avoid.	21
F	Top program: theory and exercises.	21
F	Thanks, I experienced this as an opportunity to grow.	21
M	Most helpful: information on sleep, what to do & avoid, sleep diary, anchoring exercise.	18

IT-I Program per session (**Table A2**)

Table A2. IT-I Program, overview per session.

Before the start	
Intake interview	
ISI, Sleep/wake diaries	
Medication inventory, Informed Consent	
Program per session	
Session 1	Session 2
1) Welcome, and explanation	1) Welcome. Sleep/wake diaries are gathered
2) Introduction of participants & personal objectives	2) Relaxation exercise: Breathing
3) Exercise "The meaning of sleep from six angles" (initial MCII exercise)	3) Participants introduction continued. What is your angle of focus?
4) Brief introduction on sleep	

Continued

- 5) What is your takeaway?
- 6) **Assignment:** Reflect on today's session.
 - 6.1) Prepare 2nd sleep/week diary for next week
 - 6.2) How to work your preferred angle? (Implicit MCII focus)
- 7) Closure

Session 3

- 1) Welcome
- 2) Relaxation exercise: Breathing
- 3) Reflection on the past week and share experiences
- 4) Parallel sessions:
 - 4.1) Sleep diary: "onset problem" - "nighttime awakening" personal advice
 - 4.2) Exercise: "Embrace your sleep" (to apply MCII)
- 5) What is your takeaway?
- 6) **Assignment:** Reflect on today's session
 - 6.1) Consider your preferred 24 hours. Pattern and make notes
- 7) Closure

Session 5

- 1) Welcome
- 2) Exercise: virtual relaxation
- 3) Reflection on the past week and share experiences
- 4) Exercise: "From dysfunctional (thoughts) to action-oriented"
- 5) What is your takeaway from this session?
- 6) **Assignment:**
 - 6.1) What are the dysfunctional thoughts you want to change?
 - 6.2) Reflect on changing your thoughts and prepare to share
- 7) Closure

Session 7

- 1) Welcome
- 2) Relaxation exercise: of choice
- 3) Reflection on the past week and share experiences
- 4) Exercise: Express feelings connected to the helping thoughts or intentions
- 5) Exercise: Apply Imagery Rehearsal for nightmares (when applicable)
- 6) What is your takeaway from this session?
- 7) **Assignment:**
 - 7.1) Apply what you learned and make notes on experiences
 - 7.2) What do you need to anchor what you have learned?
- 8) Closure

- 4) Exercise "Cross the line". Sleephygiene & education: What helps to sleep and what to avoid. Sleep * omeostasis, Circadian process, Zeitgebers, ...
- 5) What is your takeaway from this session?
- 6) **Assignment:** reflect on today's session, 3rd week sleep/wake diary
- 7) Closure

Session 4

- 1) Welcome
- 2) Exercise: progressive relaxation
- 3) Reflection on the past week and share experiences
- 4) Dysfunctional thoughts: returning thoughts, worries
 - 4.1) Exercise: "Playing with thoughts".
- 5) What is your takeaway from this session?
- 6) **Assignment:** Reflect on today's session
 - 6.1) Practice the exercise and make notes on the results
- 7) Closure

Session 6

- 1) Welcome
- 2) Exercise relaxation: mindfulness
- 3) Reflection on the past week and share experiences
 - 3.1) Sleep/wake diary
 - 3.2) How you handled (dys)functional thoughts
- 4) Exercise: "Solve hindering thoughts or implementation hinders"
- 5) What is your takeaway from this session?
- 6) **Assignment:**
 - 6.1) Apply what you learned and make notes
- 7) Closure

Session 8

- 1) Welcome
- 2) Reflection on the past week and share experiences: What does your sleep looks like, what are your anchors?
- 3) Parallel:
 - 3.1) Individual exit interview with facilitators.
 - 3.2) Answer ISI and program evaluation form
- 4) Exercise: What can you do in case of de-railing? What is your fallback scenario?
- 5) Plenary reflection on the therapy: How was it valuable for you?
- 6) Closure with a festive touch.