



Insomnia Treatment for Adolescents: Effectiveness of Group- and Internet  
Therapy for Sleep, Psychopathology, Cognitive Functioning, and Societal Costs  
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## Summary

Insomnia is one of the most prevalent mental health problems in adolescents, and the most prevalent sleep disorder, with high chronicity and severe consequences for daily life, but up to date effectiveness of treatment has not been established for this age-group. The aim of this dissertation was to examine feasible, easy accessible, and effective treatment for insomnia in adolescents, investigate treatment effects on symptoms of psychopathology and on cognitive functioning, explore the role of sleep hygiene in adolescent insomnia and effects of therapist feedback in Internet treatment, and examine the cost-effectiveness of Internet CBTI versus face-to-face group CBTI in adolescents.

In a randomized controlled trial with 116 adolescents with primary insomnia the efficacy of cognitive behavioral therapy for insomnia (CBTI) in a short treatment protocol called ‘SlimSlapen’ (‘SleepingSmart’) was investigated in face-to-face group therapy and Internet therapy compared to a waiting list. Both modalities appeared effective with medium to large effect sizes for sleep variables over the short and longer term up to one year after treatment (Chapters 2, 3 and 4). There appeared slightly better results for group CBTI but adolescents from both modalities reached similar endpoints. Symptoms of psychopathology were reduced after CBTI. Mediation analysis showed that improvements in symptoms of anxiety and depression were fully mediated by improvements of insomnia symptoms, and improvements in ADHD problems were partially mediated by improvements of insomnia symptoms (Chapter 4).

In a randomized controlled trial with 32 adolescents with primary insomnia, the effect of Internet CBTI on cognitive functioning was investigated. The results indicated that CBTI can have positive effects on cognitive functions in adolescents, with notable improvements for visuospatial processing and phonological working memory but not for visuospatial working memory (Chapter 5). From a review of 16 studies on sleep manipulation and effects on cognitive functioning in adolescents (Chapter 6) it appeared that sleep restriction showed small, inconsistent, or no effects, whereas sleep deprivation, sleep extension, and sleep improvement showed larger and more consistent effects. Due to limitations regarding uniformity of cognitive domains, the impurity problem of cognitive tests, and the nature and chronicity of the sleep restriction/manipulation, results in this field so far are inconclusive (Discussion).

A study with 186 normal sleeping adolescents and 112 adolescents with insomnia confirmed the validity of the Adolescent Sleep Hygiene Scale and its applicability in research and clinical practice. Furthermore, the improvement of sleep hygiene as measured with the ASHS after CBTI for adolescents with primary insomnia underscored the importance of sleep hygiene in adolescent sleep (Chapter 7). Although there has been insufficient evidence for the component sleep hygiene in adult CBTI as an individually effective intervention, the results from our study may indicate that sleep hygiene can decrease adolescent insomnia (Discussion).

In a study on therapist feedback and efficacy of Internet CBTI with 52 adolescents with primary insomnia, we found four factors of therapeutic feedback, called Forging a working alliance, Forging therapy integrity, Forging a positive attitude, and Sleep expertise. Only Sleep expertise appeared to be related to better outcomes after treatment, whereas for the other factors there appeared no relation or a negative relation (Chapter 8). This confirms

results from other studies which indicate that the role of the therapist in Internet therapy might be intrinsically different compared to traditional therapy. However, research has also shown that the guidance of a therapist in Internet delivered therapy has a strong positive influence on the effectiveness of therapy. Since Internet delivered therapies can be as effective as traditional therapies for many mental health issues, and Internet therapy appears more accessible, the issue concerning the involvement of a therapist, and its relation to characteristics of the client, the disorder, and the treatment content, need to be addressed in order to facilitate further dissemination of Internet delivered therapies (Discussion).

From a cost-effectiveness analysis comparing costs and effects of 31 adolescents treated with face-to-face group CBTI with 31 adolescents treated with Internet CBTI, it appeared that Internet CBTI was more cost-effective. This was mainly due to lower intervention costs for Internet CBTI, whereas group CBTI had slightly larger effects.

Taken together, the findings in this dissertation provide evidence for the feasibility, the accessibility, and the efficacy of CBTI to treat adolescent insomnia in both group and Internet formats. The improvements in primary and secondary outcomes stress the importance to disseminate this relatively short treatment protocol broadly in clinical practice.