Data Supplement for Forsell et al., Proof of Concept for an Adaptive Treatment Strategy to Prevent Failures in Internet-Delivered CBT: A Single-Blind Randomized Clinical Trial With Insomnia Patients. Am J Psychiatry (doi: 10.1176/appi.ajp.2018.18060699)

Appendix A: Treatment description

The treatment is an Internet delivered Cognitive Behavior Treatment for insomnia (ICBT-i) based on a self-help book written by Dr. SJ (1) that has been adapted into an ICBT-format and previously tested in three randomized controlled trials (2-4). The basis of the treatment are the two primary components of CBT for insomnia: sleep restriction and stimulus control (5) which is the main focus of the entire treatment protocol used.

The treatment consisted of written material divided into modules (chapters) that were accompanied by worksheets and homework assignments as well as a sleep diary. The order of the modules was fixed in the standard treatment but could be altered for Red-Adapted patients once a new treatment plan was in place. Modules 1-3 were general introductory models and module 4 introduced the sleep restriction methodology. In module 4, patients should start sleep restriction. The patient was expected to finish modules 1-3 within a week and after that finish about one module per week. After module 5, patients are encouraged to engage with the remaining materials as a compliment to the sleep restriction and stimulus control during the remaining weeks.

The treatment was guided via written text-messages within the treatment platform by a licensed psychologist or supervised psychologist in training, who would review and give feedback on sleep diaries, homework assignments and symptom ratings as well as answer any questions the patient might have.

Module	Title	Content
1	Introduction	How the platform works, facts about sleep. What is sleep, what is it for? How much sleep do we need, and what consequences does sleep have? Is there such a thing as morning and evening people? What is insomnia?
2	The CBT-model	More about insomnia – how do we get insomnia and why does it not remit spontaneously? Introduction to cognitive behavioral therapy. Information about sleep medication and creating a cessation plan (optional)
3	Tired or sleepy-myths	Learning the difference between feeling tired and actually being sleepy/sleep deprived. Learning about the myths about sleep that may exacerbate insomnia.
4	Sleep rhythm	Introduction to sleep restriction and getting started
5	Bed-signals	Introduction to stimulus control and getting started
6	Daytime and bed-time	Routines for getting sunlight and exercise during the day and creating bed-time routines for consistency and winding down before bed
7	This is where you are	Acceptance, mindfulness, attitudes and expectations on sleep
8	Dealing with your thoughts	Cognitive reappraisal, focused on thoughts, rumination and worry about sleep
9	Sleep Hygiene-keep your sleep clean	Information and exercises about sleep hygiene such as avoiding caffeine later in the day, not drinking alcohol close to bedtime, keeping your bedroom cool and dark, and not having heavy meals at night

10	More thoughts, more acceptance	Some extra mindfulness materials and repetition of acceptance and cognitive reappraisal
11	So far and moving forwards	Summary and relapse prevention

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Appendix B: the Individual Outcome Prediction-algorithm and procedure

An in depth description and evaluation of the procedure and algorithm used to classify patients as Green or Red in beyond the scope of this study and will be explored extensively in upcoming studies.

The creation and nature of the algorithm

The algorithm is based partly on the literature regarding predictors and moderators of change in CBT for insomnia but is primarily built on regression analyses (unpublished) on data from our research group's previous studies regarding predictors of treatment outcome that can be measured at baseline or early in treatment. The algorithm is most strongly influenced by change in ISI score pre- to week 3 and absolute ISI score at week 3. The third step of the algorithm includes clinician ratings on presumed key factors of adherence and effect. These are based on the clinical experiences of the research group and have not been experimentally tested. Both these and the specific combinations of predictors used in the algorithm is to be viewed as estimations based partly on predictive analyses and partly on clinical knowledge. This makes our findings in this study especially promising since they represent the accuracy of this tool without any optimization and very little risk of overfitting.

Measures included in the algorithm

From Pre-treatment: The sum of the CORE-10 (1); General Self Efficacy scale (GSE) (2); The Sum of items 4,11,17,20,24,25,28 and 29 from the Dysfunctional Beliefs and Attitudes about Sleep Scale (DBAS) (3); The Sum of items 7,9,25 and 28 from the Sleep Related Behaviors Questionnaire (SRBQ) (4); The sum of items 1,2,3,4 from the Sleep Problems Acceptance Questionnaire plus the item "There are many activities that I do even when I have slept poorly" (5); The sum of the Perceived Stress Scale four-item version (PSS-4) (6).

From three consecutive weekly measures: The Montgomery-Åsberg Depression Rating Scale- Self report (MADRS-S) (7) and the question "To what extent have the things you've read about and done in treatment so far affected your knowledge about, and the way you think about, sleep and insomnia?" on a 5 point likert scale from "not at all" to "Very much".

From week three: Short form Working Alliance Inventory (WAI-S) (8), Treatment Credibility Scale(9) and the week 3 Insomnia Severity Index-score (10).

The procedure: The clinician fills out the spreadsheet (Appendix C) with the patient's data working through the steps consecutively and stopping whenever a decision can be made.

Step 1: Identify patients who have already dropped out or who cannot possibly continue treatment regardless of the level of support. These should be very rare.

Step 2: Input sums from the patient rated scales included in the algorithm, check the sum of red and green flags to see if a decision can be made. If Yes, classify the patient and stop the procedure. If no, proceed to step 3.

Step 3: Answer the questions in the spreadsheet according to the examples given in the manual regarding Dark-Green to Dark-Red levels. Check final score to see if decision can be made. If Yes, classify the patient and stop the procedure (randomize if Red). If no, contact study supervisor to discuss patient and decide on final classification. Then Randomize if Red.

The spreadsheet: A translated and working version of the spreadsheet used is included as appendix C.

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Appendix D: Typical Red-Adapted Cases

(Fictive: Cases do not correspond to any specific actual patients.)

In all Red-Adapted cases, the first step is a telephone interview with the patient. The therapist performs a behavioral analysis of the patient's problems, discusses it with the patient, and they come to a mutual decision on adaptations. In many cases, the actual problems the patients are having with the treatment is only discovered by the therapist during the interview.

Apart from these treatment adaptations, the therapist is allowed to spend more time writing answers to the patient in the online platform, working on the therapeutic alliance and giving extra rational and helping with more problem solving than would be possible in the standard treatment.

In many cases, individual patients would have a combination of these presented problems, perhaps having part of the problems described in one case and one or more problems from other cases. Also, these examples are common, but in no way exhaustive.

Case 1 (problems with the internet-modality of treatment)

Problems:

- The patient finds logging on to the platform cumbersome and difficult. Has had some problems sending messages and has lost input by not saving what has been put in to the platform. This has led to frustration and non-completion of modules.
- The patient finds it tiresome and disorienting reading the materials in the online platform, since the platform is not adaptable to smartphones, and the patient only has a computer at work.

Suggested and implemented solutions:

- The patient will log on to the platform only to complete weekly ISI ratings and communication between therapist and patient will be via telephone for 10 minutes every Friday morning.
- The therapist prints the relevant modules and sends them to the patient via mail.

Case 2 (problems with sleep diary and sleep window calculation)

Problems:

- The patient is having trouble understanding how to calculate the sleep window for sleep restriction.
- The patient is having problems using the online sleep diary, and is losing data due to erroneous input, gets confused by the various terms described in the diary and rational and is becoming increasingly disheartened.

Suggested and implemented solutions:

- The therapist uses the first two weeks of sleep diary (pre-treatment measure plus first week of treatment) and calculates the starting sleep window for the patient rather than instructing the patient how to do it. The patient is given his or her

bed- and rise-times and follows them until the following Friday. This is repeated every week with new sleep diary information that the patients reads over the phone from his or her pen and paper sleep diary.

Case 3 (possible problems with patient-therapist alliance)

Problems:

- The patient has stopped logging on to the platform to read messages and work with the treatment.
- During the interview, the patient is very emotional and talks willingly about her fears and difficulties with following the treatment and not feeling supported by the therapist.

Suggested and implemented solutions:

- The therapist listens actively and validates the patient's experiences.
- After having told the therapist about all the difficulties, the patient is much calmer, listens to the therapist and starts discussing possible ways of overcoming obstacles to working with the treatment.
- When the therapist suggests possible adaptations, the patient is interested, but at the end decides to continue with treatment as per the original protocol.

Case 4 (intense fear of sleep restriction and problems with treatment credibility)

Problems:

- The patient is terrified of the idea of sleep restriction and getting even less sleep.
- The patient does not believe the claims in the material and from the therapist that sleep restriction will improve their insomnia, and is convinced sleep restriction will be an awful experience – leading to nothing.
- The patient also genuinely believes that sleep restriction is harmful and that he or she could have some sort of breakdown or collapse from the treatment.
- The patient may not have read the material very diligently, may have difficulties taking in written material due to emotional arousal.
- The patient is also not responsive to the therapist's efforts to explain and motivate, but rather finds it coercing, and would prefer talking to "someone who knows what they're talking about".

Suggested and implemented solutions:

- The therapist arranges for a session for the patient with insomnia expert Dr. Susanna Jernelöv to answer questions, validate and reassure the patient that sleep restriction is likely to improve insomnia and is not dangerous, however uncomfortable it may be.
- When the patient is reassured, or willing to at least do a behavioral experiment to test their assumption, treatment continues with the therapist.
- The therapist sends out motivational text-messages several times a week spurring the patient on and congratulating the patient whenever he or she sticks to the prescribes bedtimes (as shown by the patient's online sleep diary).
- The rest of the treatment is carried out as per usual in the online platform.