

**Did you sleep well?
Phenomenology and Psychotherapy of
Insomnia Disorder and Nightmare Disorder**

**Zusammenfassender Überblick zur
Schriftlichen Habilitationsleistung**

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Abstract

The present summary deals with insomnia disorder and nightmare disorder. It begins with an introduction to insomnia disorder and the role of hyperarousal in the onset and maintenance of its symptoms. An experimental approach and a correlational study addressed the role of affect regulation and we implemented a validation of a questionnaire for the assessment of pre-sleep arousal (**publication no. 1–3**). A pilot trial accounted for the feasibility of chat-based treatment and yielded outcomes that were comparable to face-to-face therapy, however different mechanisms of effect in both chat-based treatment and face-to-face treatment were found (**publication no. 4**). Thus, the design to conduct chat-based treatment versus face-to-face treatment was applied to insomnia disorder and evaluated according to its outcomes as well as according to the patients' perceptions (**publication no. 5–7**).

The second part is dedicated to the phenomenology and treatment of nightmare disorder. Nightmares are defined as extended, extremely dysphoric, and well-remembered dreams and in most dreams, the dreamer is a victim, but there are also special sub-types of nightmares, in which the dreamer is the aggressor (**publication no. 8**), and begins with an overview that subsumes the main ideas on the onset and maintenance of nightmare disorder (**publication no. 9, 10**), and on the fact that only dreamers themselves can evaluate the distress that their dreams may cause (**publication no. 11**). Consequently, the following section is dedicated to shedding light on what the distress patients diagnosed with nightmare disorder precisely suffer from (**publication no. 12, 13**). Imagery rehearsal therapy is then introduced as the gold standard for the treatment of nightmare disorder. Its application within an Internet-based self-help setting is described from first small feasibility studies until the evaluation of its outcomes (**publication no. 14, 15**).

Zusammenfassung

Die vorliegende Arbeit beschäftigt sich mit den Störungsbildern Insomnie und der Alptraumstörung. Zu Beginn wird in die Symptomatik eingeführt und die Bedeutung von übermäßiger Erregung (Hyperarousal) für die Entstehung und Aufrechterhaltung von insomnischen Symptomen reflektiert. In einem experimentellen Ansatz und einer korrelativen Untersuchung zeigten sich Hinweise über die Bedeutsamkeit von Affektregulation, welche die Übererregung begünstigen könnte, und wir validierten ein Instrument zur Erfassung von kognitiver und körperlicher Erregung in der Phase vor dem Einschlafen (**Publikationen Nr. 1–3**). In einer Pilotstudie testeten wir die Durchführbarkeit von Behandlungen über einen Internet-basierten Chat und erzielten Wirksamkeiten, welche mit jenen von einer Behandlung von Angesicht zu Angesicht vergleichbar waren. Es zeigte sich jedoch auch, dass beide Darbietungsformen auf verschiedenen Wirkmechanismen zu beruhen scheinen (**Publikation Nr. 4**). Anschließend das Prinzip der chat-basierte Behandlung auf die Behandlung der Insomnie übertragen und mit einer Therapie von Angesicht zu Angesicht und einer Wartekontrollgruppe verglichen. Im Fokus standen dessen Wirksamkeit sowie die Wahrnehmung der Therapien durch die Patienten (**Publikationen Nr. 5–7**).

Der zweite Teil der Arbeit beginnt mit einer Beschreibung der Phänomenologie und Behandlung der Alptraumstörung. Alpträume werden als ausgedehnte, extrem dysphorische und gut erinnerte Träume definiert. In der Regel ist in diesen Träumen der Träumende das Opfer, allerdings gibt es auch Alpträume, in denen der Träumende selbst zum Täter wird (**Publikation Nr. 8**). Zunächst werden einige Grundideen zur Entstehung und Aufrechterhaltung der Alptraumstörung im Allgemeinen zusammengefasst (**Publikation Nr. 9, 10**) und es wird auf die Tatsache eingegangen, dass nur die Träumenden selbst wirklich beurteilen können, wie sehr sie unter ihren Träumen leiden (**Publikation Nr. 11**). Daher befasst sich die Zusammenfassung anschließend damit, was genau den Leidensdruck ausmacht, den die Alpträume auslösen können (**Publikationen Nr. 12, 13**). Anschließend wird in die Behandlung der Alptraumstörung mit Hilfe imaginativer Verfahren (Imagery rehearsal therapy) eingeführt, welche als wirksamste Therapie gilt, und dessen Anwendbarkeit im Rahmen einer internet-basierten Selbsthilfe-Intervention erprobt wurde. Diese Erprobung wurden kleine Machbarkeitsstudien und eine große Wirksamkeitsstudie durchgeführt (**Publikation Nr. 14, 15**).

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1. Insomnia disorder

1.1. Definition and prevalence

Insomnia disorder is defined by difficulties of initiating sleep, maintaining sleep, waking up too early and/or a poor sleep quality despite adequate opportunities for sleep. These difficulties during the night cause impairments in daytime functioning and manifest in fatigue/malaise, attention deficits, difficulty in concentration, memory impairment, social/vocational dysfunction or poor school performance, mood disturbance, irritability, daytime sleepiness, reduced motivation, energy, and initiative, proneness for errors and accidents at work or while driving, tension headaches, gastrointestinal symptoms in response to sleep loss; and/or concerns or worries about sleep. At least one daytime symptom should be present to diagnose the disorder. The individuals concerned experience an inadequate amount of sleep and some are objectively sleep deprived despite the fact that they have the opportunity to a full night of sleep.

Symptoms of insomnia differ from sleep deprivation that occurs when an individual does not have the opportunity to achieve a full night of sleep. Further, insomnia is distinct from the complaints of short sleepers who need only five hours or less to recover, and who lack daytime impairments. Chronic insomnia is often the consequence of an episode of acute insomnia due to major life events, an exhaustive lifestyle and/or medical conditions. In many patients, externally caused circumstances have already been solved and the situation is under control again, but sleep quality remains impaired. Sometimes, patients cannot name any specific causes or circumstances and others report that their symptoms have been present their whole life.

A differentiation can be made between primary insomnia and secondary insomnia. In primary insomnia, symptoms cannot be attributed to the physiological effects of a substance (e.g., drug abuse, medication), and cannot be adequately explained by a coexisting mental or medical disorder (e.g., sleep apnea, restless legs syndrome, parasomnia). In secondary insomnia, symptoms arise from a primary physical or mental illness, a coexisting mental or medical condition, or they are effects of a substance. An insomnia disorder is diagnosed if these problems become chronic, i.e., if they are present for at least a month (third revision

of the International Classification of Sleep Disorders ICSD-3; American Association of Sleep Medicine [AASM], 2014; fifth revision of the Diagnostic and Statistical Manual of Mental Disorders DSM-5; American Psychiatric Association [APA], 2013). DSM-5 categorizes insomnia disorder under “sleep-wake disorders”; the ICD-10 subsumes insomnia disorder among “behavioral syndromes associated with physiological disturbances and physical factors”.

With a prevalence of 7 %–20 % in the general public of Europe and North America, insomnia is the most common sleep disorder and the second most common mental disorder (National Institutes of Health NIH, 2005; Wittchen et al., 2011). It is evident that variation in prevalence measures across previous publications are high. This may be caused by difficulties in delineating insomnia from other mood and anxiety disorders given that most of the other mental diagnoses have insomnia as a defining feature. Further, there are significant differences in clinicians’ and researchers’ conceptions of the diagnosis. Buysse and colleagues (2004) proposed additional quantitative research criteria in an attempt to define insomnia more precisely and reliably. These included symptoms beyond sleep difficulties and daytime impairments, a sleep latency of > 30 min for at least three nights a week over the last 6 months.

1.2. The role of hyperarousal

Insomnia disorders are linked with elevated arousal (see Riemann et al., 2010, for an integrative review). While the bed in the sleep environment is associated as an object of de-arousal in normal sleepers, patients who suffer from insomnia instead react with elevated arousal due to classical conditioning. This hyperarousal can be described in terms of a somatic, cognitive and/or cortical activation. Somatic symptoms are common symptoms of sympatric enervation such as heart racing, shortness of breath, tight feelings in one’s muscles, sweating, or gastrointestinal complaints. Cognitive hyperarousal manifests in a “racing mind”, rumination, worry, feelings of being mentally alert, and elevated irritability. Cortical activation leads to increased beta-activity in the EEG during sleep (Perlis, Giles, Mendelson, Bootzin, & Wyatt, 1997), as well as more frequent (micro-) arousals during REM-sleep in comparison to good sleepers, and leads to more fragmentized REM-sleep periods (Feige et al.,

2008; Feige et al., 2013). Indeed, when awoken from REM-sleep (but not stage 2 sleep), patients diagnosed with insomnia indicated more frequently that they were awake more often than when they had been asleep or dreaming (Feige et al., 2017).

Hyperarousal may be facilitated by poor affect regulation. We were able to show that difficulties in affect regulation mediated sleep quality. We investigated individuals who lack efficient affect regulation, as they are prone to stay within a negative state of affect after a negative event, i.e., those who are state-oriented. After a rumination induction, subjective sleep quality decreased in state-oriented individuals (Giesermann, Ophey, de Jong-Meyer, & Pietrowsky, 2012; **publication no. 1**). Neuroticism was found to be associated with poor sleep quality only if participants were not able to counter-regulate this affective sensitivity, i.e., if they were also characterized with a state-oriented coping style (Giesermann, de Jong-Meyer, & Pietrowsky, 2018; **publication no. 2**).

To assess hyperarousal during period prior to sleep onset, we first translated the Pre-Sleep Arousal Scale (PSAS), the international gold standard, and secondly, validated the German version of the scale. To evaluate its psychometric properties, we translated the 16 items and a natively English-speaking psychologist re-translated the items back to English. Factorial structure, reliability, and validity were evaluated using a predominantly student sample of 268 participants. Compared to the original version, the translation yielded a 2-factor structure with good to very good internal consistency of both the cognitive and the somatic factors. However, we recommended excluding item 16: I felt “being distracted by sounds, noise in the environment (e.g., ticking of clock, house noises, traffic)”. As the term “being distracted” was translated as “Ablenkbarkeit durch Lärm und Umweltgeräusche (z. B. das Ticken einer Uhr, Haushaltsgeräusche, Verkehrslärm)”, participants may have understood the meaning more as an anxiety symptom rather than as confrontation with diverse environmental stimuli. Without item 16, both factor scores successfully discriminated between good and poor sleepers and were more strongly associated with sleep onset than with sleep disturbances throughout the night. Interestingly, the scale assessing cognitive arousal was a better predictor of subjective sleep quality than the scale assessing somatic arousal. To conclude, the German PSAS is an economic, reliable, and valid questionnaire to assess cognitive and somatic arousal (Giesermann, de Jong-Meyer, & Pietrowsky, 2012; **publication no. 3**).

1.3. Treatment of insomnia disorder

Treatment of insomnia disorder consists of medication, cognitive behavior therapy (CBT), or a combined treatment. There is an ongoing debate of which type of treatment should be delivered to which kind of patient (Schutte-Rodin, Broch, Buysse, Dorsey, & Sateia, 2008). Neither medication as a stand-alone treatment nor medication in addition to CBT were both predictive of improvements in sleep quality (Matthews, Arnedt, McCarthy, Cuddihy, & Aloia, 2013; Pillai et al., 2016).

Relevant cognitive behavioral techniques used to treat insomnia are subsumed as CBT-i. A full-ranged CBT-i (e.g., Müller & Paterok, 2010; Schutte-Rodin et al., 2008) involves a variety of techniques. According to AASM recommendations, insomnia treatment should include at least one element of CBT-i:

- (a) Psycho-education about sleep hygiene and the correction of habits that contribute to poor sleep quality,
- (b) Stimulus control, that overlaps with sleep hygiene recommendations and concentrates on behavior changes including instructing the patients to maintain regular bed-times, going to bed only when they are sleepy, leaving the bed when unable to sleep, and using the bed for only sleep and sex.
- (c) Sleep restriction as described below,
- (d) Relaxation training to dampen general arousal, and
- (e) Cognitive therapy comprises the analysis and questioning of central attitudes with the aim to change maladaptive attitudes and beliefs that hinder restorative sleep.

Here, we focused on CBT because CBT caused high, robust and sustained improvements. A meta-analysis focusing on CBT-i yielded effect sizes of $d = .88$ for sleep latency and $d = .65$ for time awake after sleep onset (Morin, Culbert, & Schwartz, 1994) and effects corresponded to those of other research groups (Riemann et al., 2017; Riemann & Perlis, 2009; van Straten et al., 2018). Thus, regarding insomnia, it is considered as the treatment of choice.

1.3.1. Sleep restriction

Most evaluated trials include the whole range of CBT-i, with sleep restriction as the core element in most of the treatment manuals. It addresses the fact that insomnia patients lie awake in bed punishing themselves in their attempt to achieve sleep. Many of them extend their time spent in bed in the hopes of finding sleep, resulting in low sleep-efficiency, i.e., the amount of sleep in relation to the total time in bed is relatively small. During the day, many patients try to save energy, cancel meetings, and refrain from doing sports in their attempt to get rest and to facilitate falling asleep. Others overexert themselves in their attempt to facilitate falling asleep. What these two approaches have in common is their willful attempt to control sleep, although the initiation and maintenance of sleep is a rather passive and implicit process that cannot be brought under willful control (cf., Espie, Broomfield, MacMahon, Macphee, & Taylor, 2006). Here the principles of sleep restriction help to break through the vicious circle because they introduce the patients to clear guidelines they can follow while simultaneously soothing feelings of helplessness and the pressure to actively control the sleep itself.

For the most part, the proceedings of sleep restriction are comparable among different manuals. According to Müller and Paterok (2010), patients are asked to keep sleep diaries and to calculate the average sleep duration they have had the previous 5 days. This period is the sleep window, i.e., the time patients are allowed to stay in bed the following week. Afterwards, patients are asked to calculate their sleep efficacy by dividing the time they thought they slept by the amount of time spent in bed. If sleep efficacy is above 85 %, the sleep window the following week will be expanded by 15 minutes. However, if sleep efficacy is below 85 %, the sleep window will be shortened by 15 minutes. However, the sleep window is never set shorter than for 5 hours. Therapists are encouraged to carefully define bedtimes together with the patients and to make plans on what should be done with the gained waking hours. The result is an objective sleep loss that facilitates periods of deep and restorative sleep. The patients' experiences from sleep restriction are that they are able to fall asleep immediately, and that they re-experience that their sleep can be recovering. Such experiences motivate many patients to sustain changes of their bedtime habits and lower rumination about sleep and the consequences of sleep loss during the day.

Morin, Culbert, & Schwartz (1994) concluded that sleep restriction and sleep hygiene were the most effective treatment elements in CBT-i although sleep hygiene is not recommended as a stand-alone-treatment. However, there is still room left for improvement. As Harvey & Tang (2003) pointed out, 1/3 of the patients that were treated did not improve with regard to their symptoms. When they compared effect sizes before and after treatment, effect sizes of $d = .94$ for sleep quality and of $d = 0.51$ for the total sleep time are common. Such medium-size effects that are indeed promising, but compared to effect sizes of CBT of other mental disorders (here effect sizes of $d > 1.00$ or more are common, some are even higher than $d = 2.00$), such results are sobering.

Furthermore, many patients concerned do not have access to specific insomnia treatment. This is caused by the fact that:

- (a) Insomnia disorder is often subsumed as a subordinate symptom of another mental disorder and considered as less serious than the other complaints.
- (b) Many practitioners believe that sleep difficulties will improve as soon as the major disorder/medical condition is treated.
- (c) Many practitioners are not trained in the management and treatment of insomnia or lack the time to address it adequately.
- (d) Many patients also disregard their complaints and consider them as not important enough, not treatable, and/or lack motivation to engage in non-pharmacologic treatment (Benca, 2005; Perlis & Smith, 2008).

Thus, addressing insomnia disorder directly and providing access to treatment are among the main challenges in the attempt to treat insomnia disorder, especially against the background that insomnia is the most common sleep disorder and the second most common mental disorder (NIH, 2005; Wittchen et al., 2011).

1.3.2. Internet-based treatment of insomnia disorder

To increase access to CBT-i, the Internet may help and indeed, there are some programs, which provided access to state-of-the-art CBT-i (Espie, Brooks, & Lindsay, 1989; Espie et al., 2012; Lancee, van den Bout, Sorbi, & van Straten, 2013; Lancee, van den Bout, van

Straten, & Spoormaker, 2012). Most Internet-based interventions deliver treatment in form of guided or unguided self-help by using a content management system, where patients can log in and obtain access to particular information, exercises and trainings. In the attempt to gain knowledge whether the Internet-based trials are comparable with a common face-to-face intervention, a recent meta-analysis concluded that outcome sizes are promising and robust, but also attested lower effect sizes compared to face-to-face interventions (van Straten et al., 2018). Some trials compared both modes of delivery, which has not led to clear results, although outcomes are slightly in favor of face-to-face treatment. While de Bruin, Oort, Bögels, & Meijer (2014) did not find any difference between Internet-based and group-delivered face-to-face therapy, results of Blom et al. (2015) and de Bruin, Bögels, Oort, & Meijer (2015) were slightly in favor of group CBT-i. Taylor et al., (2017) demonstrated slightly superior performance of individual face-to-face therapy and in Lancee, van Straten, Morina, Kaldò, & Kamphuis (2016), individual face-to-face therapy outperformed the Internet-based intervention.

1.3.3. Chat-based treatment vs. face-to-face treatment

Because these trials mainly compared an Internet-based self-help intervention with individual or group CBT-i, the question arises whether face-to-face and Internet-based communication are entirely comparable and may differ in more aspects than the fact that the former was offline and the latter was online. Following this argumentation, we decided to compare individuals in face-to-face therapy with individuals in a synchronous chat-based therapy. The aim was to create intervention groups that resembled each other as much as possible while they mainly differed regarding their mode of delivery. In face-to-face communication, patient and therapists communicate synchronously while sitting together in one room, while in chat-based communication, patient and therapist communicate synchronously and within a one-to-one setting while spatially divided, thus in the absence of any visual and auditory cues. This leads to an absence of non-verbal and para-verbal signals that normally account for a large amount of our day-to-day communication and is referred to as signal reduction. Chat-based communication does not have the advantage of minimizing

therapist resources, but it allows designing interventions with comparable settings and procedures.

Authors like Walther (1996) proposed that this signal reduction does not only hamper communication, but it rather leaves open the space for individual constructions of one's interaction partner. This is assumed to facilitate anonymity (Christopherson, 2007) and feelings of privacy, reduce social anxiety, and focus more directly on the thoughts and feelings of the individual (Caplan & Turner, 2007). Furthermore, chat-based communication was found to stimulate the patients' self-disclosure, which has been referred to as online disinhibition effect (Joinson, 2001).

In a pilot trial, we developed and applied a short-time treatment version of a manual on academic procrastination (Höcker, Engberding, Beißner, & Rist, 2009), defined as a frequent avoidance of relevant study-oriented tasks that need to be accomplished. We delivered counseling to students either via face-to-face or in a chat-based setting, tested their treatment outcomes, and addressed the relationship between perceived counselor's characteristics and self-disclosure. The perceived counselor's characteristics were conceptualized by providing a list of adjectives that were associated with a good working alliance. The students' self-disclosure was explicitly conceptualized by using visual analog scales and implicitly by using word counts. Inspired by past research, the software package LIWC (Pennebaker, Francis, & Booth, 2001) was applied and the measure on self-disclosure was formed as a composite score of the categories "I/first person", "negative emotions" and "cognitive mechanisms". The latter comprised of a composite score of the categories "insightful" that consisted of insightful words such as "notice", "deliberate", "decision", and "causal thinking", which consisted of words describing causal thinking such as "because", "influence", and "effect" (Gieselmann & Pietrowsky, 2016; **publication no. 4**).

The face-to-face and chat-based interventions were conducted by the same therapists and consisted of $n = 26$ and $n = 25$ students, respectively. Both groups equally improved regarding symptoms of procrastination, fear and insecurity, and aversion to study. As there were no differences across conditions, both groups were collapsed and a comparison of pre to post treatment yielded decreases in symptoms of procrastination of Cohen's $d = 1.42$, decreases in fear and insecurity of $d = .93$, and decreases in the aversion to study of $d = .54$. In chat-based communication, clients perceived their counselor as stricter than face-to-face

counselors were perceived like and less attractive than the face-to-face counselors were perceived like. Perceived trustworthiness of the counselor in the chat condition was more strongly associated with treatment outcome than in the face-to-face condition. Students assigned to the chat condition showed more self-disclosure reflected by their choice of words but not by their self-reports. Both kinds of self-disclosure, particularly self-reported self-disclosure were associated with better treatment outcome in the chat condition, but not in the face-to-face condition. Overall, the results indicated the importance of students' processing in chat-based counseling. Interventions may be especially beneficial if students perceive their counselor as being trustworthy and if they self-disclose. The results are in line with assumptions proposed by the online disinhibition effect (Joinson, 2001) and point to different working mechanisms of both modes of delivery. Especially in chat-based counselling, the students and their expectations and perceptions may play an important role in achieving a moderate positive treatment outcome.

1.3.4. Chat-based treatment vs. face-to-face treatment in insomnia disorder

Given the promising results from the pilot study on academic procrastination, we returned to insomnia disorder. We developed and delivered a CBT-i treatment in both a chat-based and face-to-face setting, and compared outcomes with a wait-list control group. In doing so, we developed and applied a treatment manual that consisted of an imagination exercise, a minimum of sleep hygiene and had a special focus on sleep restriction. With three consecutive sessions, the intervention was rather short. One main aim was to replicate the research design described in Giesermann & Pietrowsky (2016; see above), but with a treatment of insomnia disorder rather than procrastination and additionally tested against a wait-list control group (Giesermann & Pietrowsky, 2019; **publication no. 5**). Individuals were diagnosed with insomnia disorder according to DSM-5 (APA, 2013) as their main diagnosis. Comorbidities were tolerated though the sleep complaints had to dominate the clinical picture. Additionally, the patients had to fulfill the quantitative research criteria (Edinger et al., 2004). Data were analyzed using multilevel linear models because they allowed the inclusion of patients with incomplete data sets while still creating adequate estimates. We controlled for baseline depression and anxiety in all of these models because there were systematic

variations between the groups despite the randomization procedures. Effect sizes d were calculated as reported by Cohen (1988), while missing data were imputed on the basis of 10 data sets while assuming that data were missing at random. Primary sleep outcome was the overall sleep quality as assessed by the Pittsburgh Sleep Quality Index (PSQI), secondary sleep outcomes were sleep onset latency and sleep efficacy as assessed by sleep diaries (subjective outcome) and an actigraphic device (objective outcome), and sleep-related outcomes included daytime functioning and sleep-related psychological strain. Measurement time points were one week before treatment, during the week directly after treatment and 2 months later (follow-up).

We expected that both, patients that received face-to-face treatment and patients that received chat-based treatment, would improve equally regarding PSQI overall sleep quality (primary sleep outcome) as well as regarding sleep latency and sleep efficacy (diary and actigraphy data; secondary sleep outcome). Because Almlöv, Carlbring, Berger, Cuijpers, & Andersson (2009) demonstrated that therapist factors moderated treatment outcome in Internet-based treatment on depression, it was expected that face-to-face treatment would outperform the chat-based intervention regarding sleep-related outcome measures, such as daytime functioning and sleep-related psychological strain.

In doing so, $N = 73$ patients diagnosed with insomnia were randomized to either individual face-to-face treatment ($n = 27$), chat-based treatment ($n = 23$), or to a waitlist control group ($n = 22$). Indeed, there were medium to large-sized improvements regarding all dependent variables. The largest improvements could be found regarding sleep quality (PSQI) in both the chat-based and the face-to-face treatment ($d_{\text{FtF}} = 1.02$, $d_{\text{chat}} = 1.69$) and improvements remained and slightly increased at the 2-months follow-up ($d_{\text{FtF}} = 1.18$, $d_{\text{chat}} = 2.40$).

Regarding secondary sleep measures, improvements in objective sleep onset latency until post treatment were observed, but these improvements did not sustain. At follow-up, patients had already returned to their baseline level of sleep onset latency. By contrast, subjective improvements in sleep onset did remain until follow-up. In the same vein, there were significant improvements regarding subjective sleep efficiency in both treatments, which could not be validated objectively. Regarding total sleep times as assessed by the actigraphic device, face-to-face patients even declined in total sleep time, while chat-patients' actigraphic total sleep times did not change.

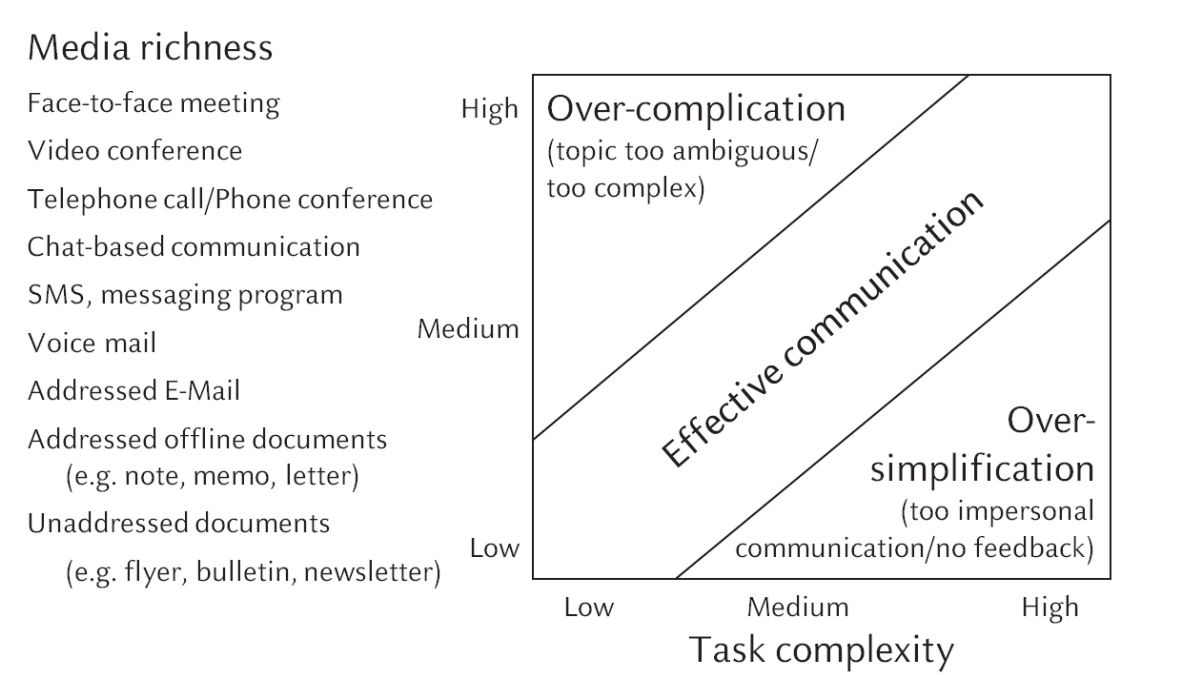
If there were differences between the face-to-face and chat-based treatment regarding sleep-related outcomes, they were always in favor of the chat-based treatment. Regarding depressive symptoms, chat-patients improved more in depression than face-to-face patients at the follow-up ($d = -0.67, p = .028$). Regarding anxiety, chat-patients improved from pre-test to the follow-up ($d = 0.63, p = .002$), while face-to-face patients did not improve ($d = 0.27, p = .183$; face-to-face vs. chat, $d = -0.25, p = .217$). Chat-patients decreased more in cognitive pre-sleep arousal than face-to-face patients did ($d = -0.82, p = .039$).

To conclude, psychotherapy of insomnia also works in the absence of visual and auditory cues provided by the therapist. In doing so, chat-based communication may enable insomnia treatment for patients who cannot or who do not want to visit face-to-face psychotherapists in their practices. At the same time, these patients may want to benefit from a therapist in person, who can provide help beyond the possibilities of Internet-based self-help applications.

If there were differences between the groups, they were always in favor of the chat-based condition and this tendency increased from post treatment to the follow-up rather than the differences between the face-to-face treatment and the chat-based treatment declined what one might have expected. Given the lack of statistical power to detect differences between both treatment conditions, results need to be interpreted carefully. Still, our findings go against a recent meta-analysis that attested lower effect sizes of Internet-based interventions (van Straten et al., 2018). Furthermore, they go against other trials that directly compared both conditions and presented results that were slightly or significantly in favor of face-to-face group therapy (Blom et al., 2015; de Bruin et al., 2015; Lancee et al., 2016; Taylor et al., 2017; but see de Bruin, et al. [2014], who did not find any difference). Given that the Internet-based condition in other studies were comprised mainly of Internet-based self-help, the more individual setting the chat provides may have motivated the patients to implement demanding behavior changes claimed by sleep restriction. Rather, the absence of visual and auditory therapist cues might have stimulated feelings of autonomy and a sense of responsibility for treatment success. Furthermore, chat-based patients may have experienced less change in their daily life after treatment was finished. After treatment, face-to-face patients discontinued travelling to the outpatients' ambulance, which many of them perceived as

stressful, while chat-patients’ daily routines were less affected and fewer things changed after the treatment ended.

To have a better understanding of the patients’ experience in both treatment conditions, follow-up interviews were implemented and were all conducted face-to-face, transcribed, and analyzed using content analyses according to Mayring (1991). The patients’ comments were interpreted against the background of media richness theory (Gieselmann, Podleschka, Rozental, & Pietrowsky, 2020; **publication no. 6**). The main idea of media richness theory was to demonstrate that managers choose their communication medium according to the ambiguity and complexity of the situation (Daft, Lengel, & Trevino, 1987; Trevino, Lengel, & Daft, 1987). The more ambiguous and the more complex the task, the richer the medium of choice should be. When their aim was to become better acquainted with each other in non-routine tasks, complex problems, and interpersonal conflicts, managers were more likely to choose face-to-face communication. On the other hand, telephone conferences and e-mail were preferred for routine information exchange, routine decision-making, and official communication, thus in situations low in uncertainty and ambiguity. Besides, communication formats low in media richness were applied to gain empowerment and to transmit a message effectively (Trevino, Lengel, & Daft, 1987; see Figure 1).



▲ 1 Media richness theory (based on Daft et al., 1987)

Former research has indicated that patients in treatment and individuals interested in treatment that were placed on a waitlist were more skeptical regarding Internet-based interventions than the healthy control group. They particularly feared a lack of data protection and that there might be misunderstandings between therapists and patients (Gieselmann, Böckermann, & Pietrowsky, 2015; **publication no. 7**). With these results in mind, we discussed whether this theory of media richness and their application on leadership can be applied to psychotherapy, thus whether more complex symptoms need more complex communication forms of delivery. Following Mayring (1991), the categories “treatment effects”, “elements of treatment”, “communication”, and “intervention tools” were extracted from the text. Then, the number patients’ statements that were assigned to each category were compared between both treatment groups using quantitative comparisons (Chi-Square tests). Further, we compared the post session reports that were psychometrically constructed according to Grawe (1997)’s theory on working mechanisms. These post session reports were available from both patients and therapists.

If they had to decide for themselves, almost all patients would have chosen the face-to-face setting because they were familiar with it. However, patients that were randomized to the chat-based intervention changed their attitude towards a more neutral evaluation after they finished chat-based treatment. When it came to sleep problems, several patients indicated that they were satisfied with the setting, but would rather prefer face-to-face communication for more personal issues. In the chat condition, the therapist as an individual appeared to be less relevant as there were more patients that indicated that they were not concerned with the therapist as individual.

This effect goes together with the therapists’ evaluations on working mechanisms. Their evaluations correlated well with treatment outcome, but only with the face-to-face treatment and not in the chat-based treatment. The higher their ratings on the quality of the session outcome, the global working alliance, as well as on the patient’s openness, problem actuation, receptiveness, and emotion regulation, the higher treatment outcome. However, in the chat-condition, interactional difficulties only were predictive of treatment outcome (the lower the difficulties the better the outcome). This may indicate that the therapists in the face-to-face treatment had a more complete picture of the patients and their progress than in the chat condition.

Directly after the intervention, patients of both conditions reported the same effects the treatment had caused. Both were equally positive or negative, but regarding long-term effects, chat-patients were more positive about treatment effects, while face-to-face patients were more differentiated and more frequently indicated both positive and negative outcomes. Thus, Face-to-face patients may have expressed more differentiated statements because they were more experienced with a communication format that leaves open space for the communication of nuances, i.e., of both positive and negative elements. All findings from both the content analysis and the psychometric data may be interpreted within the framework of media richness theory. For clearly defined and well-diagnosed mental disorders, the Internet provides an appropriate format, while topics that are ambiguous, complex and topics that need a more precise clarification may need more a complex mode of delivery.

1.3.5. Implications of the reported findings

The large and lasting effect sizes we obtained from our short intervention that lasted only three sessions and remained stable at least until the three-month follow-up were particularly pleasing. Careful selection procedures may have facilitated these large effect sizes. Although comorbid disorders were tolerated, patients with symptoms of insomnia disorder were recruited to take part in a study addressing insomnia disorder. Thus, patients that had clear expectations and matched nicely with what was offered were recruited. Notably, the patients were highly motivated to invest time and effort on treatment for a clearly defined period and that were very motivated to change their behavior. So, it can be questioned whether our sample is representative of a common outpatients' sample. Still, outcomes may motivate therapists to engage in sleep restriction and its benefits may motivate patients to sustain the typical adverse effects sleep restriction typically provides in the first instance.

Furthermore, the findings may suggest the importance of personalized care provided by human beings, given that our outcomes go against effects of results on other trials addressing Internet-based self-help for insomnia disorder. The importance of personalized care is further underpinned by observations from content analysis, where patients who received face-to-face treatment provided more complex evaluations regarding the long-term effects

of treatment than patients who received the chat-based treatment. Besides, the importance of personalized care provides more complex communication formats and may match with statements that more complex disorders may need more individualized treatment.

The impressive speed of programming options are advancing as well as the speed that Artificial Intelligence is improving (Hoermann, McCabe, Milne, & Calvo, 2017) may blur differences between Internet-based and face-to-face communication in the future. Thus, for now, the Internet-based setting may help to treat more patients in need, but it cannot replace careful diagnostic procedures. Face-to-face interventions may be more appropriate for more ambiguous and complex mental disorders than the Internet-based setting.

2. Nightmare disorder

2.1. Definition and prevalence

Nightmare disorder is defined by the repeated occurrence of “extended, extremely dysphoric, and well-remembered dreams”, which causes clinically significant distress or impairment in social, occupational, or other important areas of functioning, and which are not attributable to the physiological effects of a substance (e.g., drug abuse, a medication). They cannot be adequately explained by a coexisting mental or medical disorder (ICSD-3; AASM, 2014; DSM-5; APA, 2013). Although nightmares often lead to awakening, according to the DSM-5, awakening is not a necessary criterion to diagnose nightmare disorder.

Both ICSD-3 (AASM, 2014) and DSM-5 (APA, 2013) define a nightmare as an “extended, extremely dysphoric” dream that “usually involves efforts to avoid threats to survival, security, or physical integrity”. Nightmares usually occur during REM-sleep (APA, 2013; Nielsen, 2000; but see Solms, 2000) and are associated with symptoms of physical arousal such as sweating and shortness of breath and more elevated indices of periodic leg movements during REM-sleep (Germain & Nielsen, 2003). In most nightmares, the dreamer is a victim of an aggressor or any kind of sinister event, though there are also nightmares where the dream-self can become the offender. In a first attempt to quantify these so-called offender nightmares, about 18 % to 28 % of the reported nightmares were classified as offender-nightmares. Most of the aggressive acts within these dreams were intentional and dealt with the fact that these dreamers have killed a person. Most of the dreamers that dreamt offender-nightmares indicated that they did so to defend themselves (Mathes et al., 2020; **publication no. 8**). Little is known about the function the offender nightmares may have for the dreamer. Offender nightmares may help to gain control over one’s dreams, but may also cause psychological strain as soon as the dreamer self-sacrifices his or her actions for moral reasons. However, such questions remain to be tested.

A more common differentiation between different kinds of nightmares is that between posttraumatic and idiopathic nightmares. Posttraumatic nightmares are direct repetitions of a traumatic event or they are symbolically related to the trauma, whereas idiopathic nightmares do not follow a traumatic event and contain more fictional stories. Posttraumatic nightmares occur more frequently in those concerned with traumatic experiences, lead to more severe arousal, and more nocturnal awakenings and were associated with stronger aggression and helplessness (Wittmann & de Dassel, 2015).

Frequent nightmares are associated with a wide range of mental health complaints; sleep disruptions and insomnia, i.e., difficulties in sleep onset and maintenance together with compromised daytime functioning (Cattarius & Schlarb, 2016; Krakow, 2006; Lancee & Schrijnemaekers, 2013; Lancee, Spoormaker, & van den Bout, 2010). Further consequences are tiredness upon getting up, daytime sleepiness, lack of energy, petulance, difficulties in concentrating, worries about having enough sleep (Lancee & Schrijnemaekers, 2013), increased mental illness (Blagrove, Farmer, & Williams, 2004; Levin & Fireman, 2002), poor academic performance (Wiechers et al., 2011), maladaptive personality functioning (Köthe & Pietrowsky, 2001; Pietrowsky & Köthe, 2003; van Schagen, Lancee, Swart, Spoormaker, & van den Bout, 2017), and a significant increase in attempting and re-attempting suicide (Nadorff, Nazem, & Fiske, 2011; Sandman et al., 2017; Sjöström, Hetta, & Waerna, 2009).

Between 4 % and 8 % of the general adult public (Li, Zhang, Li, & Wing, 2010; Munezawa et al., 2011; Sandman et al., 2013; Schredl, 2010), 6 % to 11 % of children (Wiechers et al., 2011), and 16 % to 67 % of adult patients in a sample with complex mental disorders (anxiety disorders & posttraumatic stress disorder [PTSD], respectively; Swart, van Schagen, Lancee, & van den Bout, 2013) report recurrent nightmares. Across all epidemiological data, nightmares occurred more frequently in women than in men.

We published a recent state of the art essay on the vicious circle that causes the onset and maintenance of nightmares because of the interplay of hyperarousal and impaired fear extinction (Gieselmann et al., 2019; Schmid, Steil, & Gieselmann, 2019; **publication no. 9, 10**). It refers to PTSD, in which hyperarousal during the day is present, i.e., a tendency of elevated nervousness, tension, jumpiness, and the inability to unwind, and hyperarousal at night is also present, i.e., an increased beta activity of the EEG, a fragmentized REM-sleep and more frequent micro arousals are well-known phenomena. As outlined above, patients

diagnosed with insomnia disorder were also found to display a more interrupted sleep in the EEG (Feige et al., 2013, see above). Just as hyperarousal is found to be typical for both PTSD and insomnia, it may also help to understand the onset and maintenance of nightmare disorder. Furthermore, Nielsen and Levin (2007) point out that fear extinction is impaired in nightmare disorder. Thus, the process of combining fearful memory fragments with neutral or other harmless fragments in order to dissociate them from other nightmare fragments is hampered. The more hyperarousal and impaired fear extinction are both enhanced, the more likely these memory fragments condense into a nightmare script, i.e., an endless and stereotypic replay of one particular nightmare or of slight variations of such a nightmare story. This interplay is assumed to be facilitated by traumatic experiences, childhood adversity, trait susceptibility, and maladaptive cognitive processing, as well as by physiological factors such as sleep disordered breathing.

2.2. Nightmare frequency and nightmare distress

Neither ICSD-3 (AASM, 2014) nor DSM-5 (APA, 2013) name a certain number of nightmares required to diagnose a nightmare disorder. However, the DSM-5 suggests a mild nightmare disorder as less than one episode per week on average, a moderate disorder with one or more episodes per week, but less than nightly, and a severe disorder with nightly episodes (APA, 2013). APA (2013) and Thünker and Pietrowsky (2010) consider more than 12 nightmares a year as frequent nightmares. However, both large diagnostic compendia did not name any specific frequency criteria that need to be fulfilled in order to diagnose individuals with nightmare disorder. This may be caused by clinical observations on large inter-individual differences in information processing. Some patients may have had one nightmare that deeply affected their well-being, while others may report frequent nightmares, but do not bother much about them. In line with such clinical observations, the relationship between nightmare frequency and well-being was also empirically found to be mediated by nightmare distress (Blagrove et al., 2004). Put in other words, well-being was reduced only if patients suffered from their nightmares, irrespective of the total number of nightmares.

Another study from our department addressed the question on the precise turning point of when dreams turn into nightmares. In doing so, we asked participants to keep dream diaries and evaluate both their normal dreams and their nightmares. These ratings were compared with ratings of blind external raters (Mathes, Gieselmann, & Pietrowsky, 2020; **publication no. 11**). The main result was that the participants were more distinct in their ratings than neutral and blind raters were in their evaluations. Besides, self-raters appraised their nightmares as more negative and normal dreams as less negative compared with the appraisals of external raters. These findings also underpin the role of personal evaluations: The way the dream is perceived and named as a nightmare mainly lies in the eye of the dreamers themselves. The dreamers themselves are to judge whether the dream they have dreamed was a dream or whether it was a nightmare. These switches cannot be understood or validated by blind external raters. Thus, only the dreamers themselves can evaluate the distress that their dreams may cause.

A literature review indicated that there are different concepts about how to define the distress the nightmares may cause. These conceptualizations could be subsumed according to:

(a) *Nightmare intensity*

(as assessed by the cognition, emotions, and behaviors during or immediately after one has had a nightmare),

(b) *Nightmare effects*

(as assessed by the effects of nightmares on social and health-related areas),

(c) *Nightmare related symptoms*

(as assessed by more persistent psychological and sleep related consequences), and

(d) *The perception of nightmare distress*

(as assessed by the subjective appraisal of the nightmare sufferer themselves;

Böckermann, Gieselmann, & Pietrowsky, 2014; **publication no. 12**).

Most often, nightmare distress is assessed with the Nightmare Distress Questionnaire (NDQ) developed by Belicki (1992). To better understand what precisely the NDQ measures, we ran a factor analysis across the NDQ items (German version). This was done across a sample of 213 patients diagnosed with nightmare disorder (84 % female, 18–75 years, $M = 37.08$ years, $SD = 13.73$; nightmares the previous month: $M = 14.13$, $SD = 8.31$, $range = 2–48$). Reliability was good (Cronbach's $\alpha = .80$) and medium-sized correlations were found between nightmare distress scores, nightmare frequency, depression (CES-D; Center for Epidemiologic Studies Depression Scale), and sleep quality (PSQI; Pittsburgh Sleep Quality Inventory). We identified three subscales, which explained 52 % of the total variance:

(a) *General concerns about nightmares*

(e.g., “Do you feel you have a problem with nightmares?”,
explained variance: 32 %, $\alpha = .80$),

(b) *Their impact on sleep quality*

(e.g., “Do nightmares interfere with the quality of your sleep?”,
explained variance: 11 %, $\alpha = .64$), as well as

(c) *Daytime beliefs and perceptions*

(e.g., “Do your nightmares predict the future?”,
explained variance: 9 %, $\alpha = .51$).

Replicating Belicki's (1992) data, the NDQ sum score on nightmare distress was only moderately correlated with nightmare frequency, and suggests that nightmare distress is a construct different from nightmare frequency. Further, nightmare distress (as assessed by the NDQ) was more strongly associated with personality traits and impaired mental health than nightmare frequency (Böckermann et al., 2014).

However, the NQD has been criticized because 10 of 13 items have to be rated on a frequency scale that ranges from never to always, although distress is rather a construct that varies from low to high intensity. Schredl, Landgraf, & Zeiler (2003) demonstrated that nightmare distress was even more distinct from nightmare frequency when distress was measured using intensity scales instead of frequency scales (Schredl et al., 2003). Following Spoormaker

(2008), who criticized that there is no integrative definition of nightmare distress, we conceptualized nightmare distress according to Lazarus' (1966) transactional model of stress and argued that individuals feel more distressed about their nightmares the more they feel threatened and harmed by themselves and the lesser they rely on available coping skills. Based on these assumptions, the questionnaire of Cognitive Appraisal of Nightmares (CAN) was depicted empirically in a first sample ($N = 504$) addressing individuals that have "experienced distressing nightmares" (72 % female, 18–84 years, $M = 33.29$ years, $SD = 12.82$; nightmares the previous month: $M = 4.20$, $SD = 6.26$, $range = 0–80$) using explorative factor analyses.

The scales were named:

(a) *blame/credit*

(e.g., "I know who or what is responsible for my nightmares.",

explained variance: 25 %, $\alpha = .88$),

(b) *nightmare harm*

(e.g., "After a nightmare, I am aware of how vulnerable I am.",

explained variance: 22 %, $\alpha = .67$),

(c) *coping potential*

(e.g., "I have a solution which provides an escape from nightmares.",

explained variance: 12 %, $\alpha = .64$), and

(d) *nightmare threat*

(e.g., "I am scared that my nightmares could come true.",

explained variance: 10 %, $\alpha = .79$)

Across all scales, total explained variance was 68 %, $\alpha = .62$. The loadings of the items on their designated factor could be confirmed with a second sample of $N = 402$ participants that "experienced distressing nightmares" (87 % female, 18–77 years, $M = 28.38$ years, $SD = 10.23$; nightmares the previous month: $M = 6.31$, $SD = 7.22$, $range = 0–50$). Against our expectations, *blame/credit* was negatively associated with nightmare frequency and nightmare distress (NDQ), which indicated that knowing the cause of the nightmare was associated with

a higher nightmare frequency and more distress. To account for this effect, the scores of these items were inversed before they were integrated into the sum score, indicating that the higher the values, the more the participants knew what caused their nightmares. All scales of the CAN questionnaire correlated significantly with the total score and there was a medium to high correlation between the sum score and nightmare distress (measured by the NDQ). Plausible correlations with other measures of nightmare distress, sleep quality, and neuroticism were found. The sum score of the CAN was more distinct from nightmare frequency than the nightmare distress (NDQ) was distinct from nightmare frequency. This is in line with former results that suggested that distress and frequency differ more from each other when distress is assessed using intensity scales (as applied to rate the CAN items) rather than on frequency scales (as applied to rate the NDQ items; Schredl et al., 2003). They further underpinned that frequency and distress both picture different concepts. The NDQ was particularly associated with behaviors the patients did after a nightmare, while the CAN was particularly associated with physiological and emotional consequences that were caused by the nightmares. In order to obtain a multifactorial and theory-driven picture about how individuals appraise their nightmares, the CAN may be convenient (Gieselmann, Elberich, Mathes, & Pietrowsky, 2020; **publication no. 13**).

2.3. Treatment of nightmare disorder

Just as in insomnia disorder, nightmares are often considered as a subordinate symptom of depression disorder, anxiety disorder, or PTSD. This may be one main cause why, in practice, a nightmare disorder is rarely diagnosed. Different from insomnia disorder, patients concerned hardly report their symptoms to practitioners. If help was sought, most patients consulted their general practitioners or medical specialists and less than one-third to one-fifth of those who sought professional help reported that the advice they received was helpful (Nadorff, Nadorff, & Germain, 2015; Schredl & Göritz, 2014; Thünker, Norpoth, von Aspern, Özcan, & Pietrowsky, 2014). However, specific treatment exists for nightmare disorder and there are a number of evaluated manuals available (Gieselmann et al., 2019), but patients concerned hardly have access to therapists that apply these treatment manuals.

The AASM recommends imagery rehearsal therapy (IRT) as the treatment of choice to treat nightmare disorder, which is the only intervention technique that was recommended without any restrictions (Morgenthaler et al., 2018). IRT was found to help in-patients that suffer from idiopathic nightmares as well as those that suffer from posttraumatic nightmares (Krakow et al., 2001; Thünker & Pietrowsky, 2012; van Schagen, Lancee, de Groot, Spoormaker, & van den Bout, 2015).

2.3.1. Imagery rehearsal therapy (IRT)

IRT allows the patients to work on their nightmares during the day when they are in a safe environment. The patient is asked to recollect the story plot and then change the story of the nightmare. There are different ways to instruct the patients. Originally, patients were asked to “change the nightmare anyway you wish” (Kellner, Neidhardt, Krakow, & Pathak, 1992). Thus, no direction is suggested into which way the nightmare should be changed or whether the nightmare should address the storyline or particularly the ending. Others proposed to change the nightmare into a “triumphant” (Marks, 1978), “satisfactory”, or “more neutral or even pleasant” (Thünker & Pietrowsky, 2012) ending. Patients are then instructed to rehearse the rescripted nightmare in the patients’ imagination a couple of times each day. Several meta-analyses exist that reported effect sizes of around Cohen’s $d = 1.00$ (Augedal, Hansen, Kronhaug, Harvey, & Pallesen, 2013; Casement & Swanson, 2012; Cranston, Davis, Rhudy, & Favorite, 2011; Hansen, Höfling, Kröner-Borowik, Stangier, & Steil, 2013; Nadorff, Lambdin, & Germain, 2014; Seda, Sanchez-Ortuno, Welsh, Halbower, & Edinger, 2015). IRT not only decreased nightmare frequency, but also decreased PTSD severity (Hedges $g = 0.92$; Hansen et al., 2013) and increased sleep quality ($d = .68$; Casement & Swanson, 2012). No adverse effects were reported (Morgenthaler et al., 2018).

Treatment manuals can vary from a single session (Neidhardt, Krakow, Kellner, & Pathak, 1992) up to short time interventions that consist of 8 sessions. The latter number of sessions refers to the manual developed by Thünker and Pietrowsky (2010, 2012), who propose 7 sessions in a weekly interval and one session two or three weeks later.

The topics are scheduled as follows:

- (a) Session 1: Psychoeducation on nightmares and nightmare treatment, sleep hygiene; introduction to nightmare diaries, recollection of a typical or important nightmare
- (b) Session 2: Relaxation exercise,
- (c) Session 3: Introduction to and exercise of imaginative techniques; guided imagery followed by a playful attempt to modify the imagined picture (e.g., the patients may be caught unawares by a rainstorm while walking at the beach on a hot summer day),
- (d) Session 4-7: Nightmare modification,
- (e) Session 8: Closing session: Evaluation, reassurance, relapse prevention.

2.3.2. Internet-based imagery rehearsal therapy (IRT)

To bridge the gap between patients' needs and state-of-the-art treatment, the Internet may be helpful. We followed the agenda formulated by Ritterband, Thorndike, Cox, Kovatchev, and Gonder-Frederick (2009). Compared to synchronous one-to-one communication as applied in chat-based communication, self-help interventions provide modules, the patients work through on their own. Some of these interventions are guided by a coach who receives the progress the patient had made and comments on it, but there are unguided treatments as well that the patients complete on their own without any human feedback (Berger, 2017). Given the results of Giesermann et al. (2015), these personalized feedbacks appear to be particularly important, thus the patients should be partly work through the program while receiving feedback while others should work through it on their own. Technical basis of the current intervention was a content management system developed at Utrecht University (MyCareCMS™). MyCareCMS™ was originally developed to treat migraines by the help of focus groups as well as two pilot trials with expert patients. The system was evaluated as useful, feasible, user-friendly, and clear, though the expert patients also recommended additional patient-to-patient contact during treatment (Sorbi & van der Vaart, 2010). The gist of the migraine coach was already adapted to insomnia disorder and effect

sizes of an evaluative trial was promising (Lancee et al., 2013). Thus, an adaption to nightmare disorder appeared to be promising as well.

Thus, the manual by Thünker and Pietrowsky (2010) was applied to the Internet-based setting by making use of technical features such as audio copies, interactive graphs, and videos (step 5 according to Ritterband et al., 2009). We accounted for these suggestions by the onset nightmare diaries whose data could be monitored visually in diagrams and graphics. Relaxation and imagination exercises were provided using audio files. Open and closed question procedures, text fields, and an easy-to-use e-mail system enabled the patient to comment on their experiences and to communicate with their respective nightmare coach. Specific buttons within the treatment modules enabled the patients to print text sheets and exercise sheets and to save homework files and specific exercises in a library. Experts on nightmare treatment were asked to define appropriate situations in which feedback should be given and made suggestions regarding the content the self-help application should provide (step 6). With the mean of two pilot studies with expert patients ($N = 10$ and $N = 12$), feasibility and usability of the intervention were evaluated positively and the expert patients appeared to improve regarding their nightmare symptoms (Böckermann, Giesemann, Sorbi, & Pietrowsky, 2015; **publication no. 14**). However, the expert patients also indicated that they had relatively little fun. Albeit having fun may not have been the focus of the program, it may have contributed to a high drop-out rate. Only 58 % of the patients worked through all of the modules, which brought to light how an improvement to treatment attrition could be achieved. In doing so, the patients were asked to indicate more precisely, where and when they wanted to work through the modules at the end of each completed module and e-mail reminders were established. Furthermore, the manual was shortened and restricted to the core elements of IRT: The relaxation exercise was omitted given that it was the most unspecific exercise and provided no direct treatment for nightmare disorder. Additionally, the sessions that contained the IRT interventions were shortened from four to three modules. This may reflect that the Internet-based setting may facilitate a kind of arbitrariness and therefore may yield interventions that address the point more quickly.

- (a) Module 1: Psychoeducation on nightmares and nightmare treatment, sleep hygiene; introduction to nightmare diaries,
- (b) Module 2: Introduction to imaginative techniques; guided imagery followed by a playful attempt to modify the imagined picture (e.g., the patients may be caught unaware by a rainstorm while walking at the beach on a hot summer day),
- (c) Module 3-5: Nightmare modification,
- (d) Module 6: Evaluation, reassurance, and relapse prevention (Böckermann et al., 2015; Thünker & Pietrowsky, 2010, 2012).

To test its efficacy, the developed Internet-based intervention was tested in a sample of patients diagnosed with nightmare disorder (Giesermann, Böckermann, Sorbi, & Pietrowsky, 2017; **publication no. 15**). Further, we investigated the role of nightmare modification and the role of guidance in a randomized controlled trial that contained two intervention groups and two control groups. When randomized to one of the intervention groups, the patients had direct access to the treatment modules. After they completed one module, the patients of one intervention group received feedback from a nightmare coach. The feedback was mainly reinforcing, but also contained feedback on the modified nightmares, including suggestions on how to change the storyline as well as on other difficulties that might occur during treatment (guided IRT). The other intervention group worked through the program without receiving any feedback (unguided IRT). Both control groups were asked to monitor their nightmares. One control group (frequency control group) was asked to monitor whenever they have had a nightmare or not and to report the sheer number to the program, while patients of the other control group (narrative control group) were asked to describe their nightmares in as much detail as possible directly after waking. Feedback from a nightmare coach was available upon request for all 4 groups. $N = 127$ patients with mainly idiopathic nightmares ($n = 113$, 86 % female, 18–65 years, $M = 36.78$ years, $SD = 14.24$; nightmares the previous month: $M = 12.35$, $SD = 6.99$, $range = 2–28$) took part in the trial. Their data were analyzed using multilevel linear models because they allowed the inclusion of patients with incomplete data sets while still creating adequate estimates. The models were controlled for baseline nightmare distress, depression, and gender because there were systematic differences between patients who did not take part in the follow-up and completers

regarding these variables. Effect sizes d were calculated as reported by Cohen (1988), while missing data were imputed on the basis of 10 data sets while assuming that data were missing at random. Main dependent variables were nightmare frequency and nightmare distress, measurement time points were before treatment, directly after treatment and two months later (follow-up).

Results yielded that patients in both intervention groups displayed comparable improvements. Thus, there were no differences between the effects among patients that received feedback from a nightmare coach and those that did not receive any feedback in any dependent variable, neither regarding compliance or regarding the loss of patients during treatment. Both treatment groups that received IRT were more effective than the frequency control group with respect to nightmare frequency and nightmare distress at both, post treatment and follow-up ($d = .75$, $p = .001$, and $d = .79$, $p < .001$, respectively from pre-test to follow-up for nightmare frequency and nightmare distress). Compared to the narrative control group, IRT was only superior in improving nightmare distress ($d = .69$, $p = .012$) but not in nightmare frequency ($d = .28$, $p = .416$) because the narrative control group also improved regarding nightmare frequency.

Taken together, IRT can be delivered effectively within an Internet-based self-help application. Effect sizes were independent from whether the treatment was delivered with or without guidance by a nightmare coach. Thus, the minimal guidance that manifested in the opportunity to contact a nightmare coach and receiving reminder e-mails were sufficient that the treatment effectively reduced nightmare frequency and nightmare distress.

When the treatment groups were compared with the two control groups, results were different from what was expected. Solely describing the nightmare narrative in detail, as patients of the narrative control group did, already decreased nightmare frequency. However, with regard to inducing decreases in nightmare distress, IRT was superior to the narrative control group. In other words, writing down the nightmare narratives already had beneficial effects on nightmare frequency but not on nightmare distress; IRT may be especially beneficial in reducing nightmare distress.

2.3.3. Implications of the reported findings

The reported findings were in line with others that also showed that IRT was superior to treatment-as-usual, especially regarding reductions in nightmare distress (van Schagen et al., 2015) and corresponded with typical comments patients make after IRT treatment. Many patients stated that even if they had a nightmare, they did not bother about it much because they knew how to deal with it. These findings further highlight the importance of targeting reductions in nightmare distress within the course of treatment.

The fact that nightmare treatment is more effective the more patients gain mastery over their symptoms was proposed by Germain and colleagues (2004) as well as by Krakow and colleagues (2001). To date, it is the mostly discussed active mechanism underlying specific nightmare treatment (e.g., in IRT). In this vein, Rousseau and Belleville (2018) go one step further and conclude that successful nightmare treatment goes beyond mere cognition to be able to master one's nightmare, but also comprises significant amounts of emotional processing. The result is a profound conviction that one is able to deal with one's nightmares, which includes both explicit cognitive elements and implicit emotional processing. Such emotional processing would then facilitate memory consolidation, which manifests in a re-organization of conscious and unconscious fear structures within the memory network. Similar changes in information processing as results of psychotherapy are also discussed as active change mechanisms in disorders related to nightmare disorder, such as PTSD (e.g., Kleim et al., 2013). Insomnia that focuses on REM-sleep as facilitating factor to re-structure cognitive-affective content in order to overcome hyperarousal (e.g., Feige et al., 2013; Perlis et al., 1997). Future research may help to clarify whether such changes also account for active treatment mechanisms in nightmare disorder.

Regarding the dissemination of imagery rehearsal therapy into the health care system, such relatively small Internet-based treatments with seldom therapist contact may help to make IRT known as well as to treat more patients in need. Future research may help to answer the question for which patients this treatment is sufficient as a stand-alone treatment and which patients would need more elaborated therapy. However, the latter group of patients may still benefit from Internet-based IRT, preferably as an add-on to traditional face-to-face therapy. Such blended care offers may help to save therapist time within the limited

outpatient therapy facilities. Even in PTBS patients, IRT may cause relief and serve as a door opener to engage in an often long-lasting and distressing trauma-focused therapy. Blended care is assumed to combine the best of both worlds, the online and the offline world (Berger, 2017), but such treatments are still in the early stages of development and future research will show how patients can benefit the best from such new intervention strategies.

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Attachment A. Included publications

Publication no. 1

Gieselmann, A., Ophey, M., de Jong-Meyer, R., & Pietrowsky, R. (2012). An induced emotional stressor differentially decreases subjective sleep quality in state-oriented but not in action-oriented individuals. *Personality and Individual Differences*, 53, 1007–1011. <https://doi.org/10.1016/j.paid.2012.07.020>

Publication no. 2

Gieselmann, A., de Jong-Meyer, R., & Pietrowsky, R. (2018). Sleep quality and self-regulation: The interaction between strong state orientation and high neuroticism predicts poor sleep quality. *Somnologie*, 22, 2–9. <https://doi.org/10.1007/s11818-017-0137-1>

Publication no. 3

Gieselmann, A., de Jong-Meyer, R., & Pietrowsky, R. (2012). Kognitive und körperliche Erregung in der Phase vor dem Einschlafen: Die deutsche Version der Pre-Sleep-Arousal Scale (PSAS) [Cognitive and physical arousal in the pre-sleep phase. The German version of the Pre-Sleep Arousal Scale (PSAS)]. *Zeitschrift für Klinische Psychologie und Psychotherapie*, 41, 73–80. <https://doi.org/10.1026/1616-3443/a000134>

Publication no. 4

Gieselmann, A., & Pietrowsky, R. (2016). Treating procrastination chat-based versus face-to-face: An RCT evaluating the role of self-disclosure and perceived counselor's characteristics. *Computers in Human Behavior*, 54, 444–452. <https://doi.org/10.1016/j.chb.2015.08.027>

Publication no. 5

Gieselmann, A. & Pietrowsky, R. (2019). The effects of brief chat-based and face-to-face psychotherapy for insomnia: A randomized waiting list controlled trial. *Sleep Medicine*, 61, 63–72. <https://doi.org/10.1016/j.sleep.2019.03.024>

Publication no. 6

Gieselmann, A., Podleschka, C., Rozental, A., & Pietrowsky, R. (2020). Communication formats and their impact on patient perception and working mechanisms: A mixed-methods study of chat-based vs. face-to-face psychotherapy for insomnia. *Behavior Therapy*. <https://doi.org/10.1016/j.beth.2020.06.001>

Attachment A (continued)

Publication no. 7

Gieselmann, A., Böckermann, M., & Pietrowsky, R. (2015). Internetbasierte Gesundheitsinterventionen: Eine Evaluation aus der Perspektive von Patienten vor und während ambulanter Psychotherapie [Internet-based health interventions. Evaluation from the perspective of patients before and in outpatient psychotherapy]. *Psychotherapeut*, 60, 433–440. <https://doi.org/10.1007/s00278-015-0038-3>

Publication no. 8

Mathes, J., Renvert, M., Eichhorn, C., Freiherr von Martial, S., **Gieselmann, A.**, & Pietrowsky, R. (2018). Offender-nightmares: Two pilot studies. *Dreaming*, 28, 140–149. <https://doi.org/10.1037/drm0000084>

Publication no. 9

Gieselmann, A., Ait Aoudia, M., Carr, M., Germain, A., Gorzka, R., Holzinger, B., Kleim, B., Krakow, B., Kunze, A. E., Lancee, J., Nadorff, M. R., Nielsen, T., Riemann, D., Sandahl, H., Schlarb, A. A., Schmid, C., Schredl, M., Spoormaker, V. I., Steil, R., van Schagen, A. M., Wittmann, L., Zschoche, M., & Pietrowsky, R. (2019). Etiology and treatment of nightmare disorder: State of the art and future perspectives. *Journal of Sleep Research*, 28, e12820. <https://doi.org/10.1111/jsr.12820>

Publication no. 10

Schmid, C., Steil, R. & **Gieselmann, A.** (2019). Die Alptraumstörung und ihre Behandlung. *report psychologie*, 44, 6–9.

Publication no. 11

Mathes, J., **Gieselmann, A.**, & Pietrowsky, R. (2020). When a dream turns into a nightmare – due to negative contents or to negative appraisal? *International Journal of Dream Research*, 13, 209–214. <https://doi.org/10.11588/ijodr.2020.2.72231>

Publication no. 12

Böckermann, M., **Gieselmann, A.**, & Pietrowsky, R. (2014). What does nightmare distress mean? Factorial structure and psychometric properties of the Nightmare Distress Questionnaire (NDQ). *Dreaming*, 24, 279–289. <https://doi.org/10.1037/a0037749>

Attachment A (continued)

Publication no. 13

Gieselmann, A., Elberich, N., Mathes, J., & Pietrowsky, R. (2020). Nightmare distress revisited: Cognitive appraisal of nightmares according to Lazarus' transactional model of stress. *Journal of Behavior Therapy and Experimental Psychiatry*, 68, 101517. <https://doi.org/10.1016/j.jbtep.2019.101517>

Publication no. 14

Böckermann, M., **Gieselmann, A.**, Sorbi, M., & Pietrowsky, R. (2015). Entwicklung und Evaluation einer internetbasierten begleiteten Selbsthilfe-Intervention zur Bewältigung von Albträumen [Development and evaluation of an Internet-based guided self-help intervention for coping with nightmares]. *Zeitschrift für Psychiatrie, Psychotherapie & Psychosomatik*, 63, 117–124. <https://doi.org/10.1024/1661-4747/a000230>

Publication no. 15

Gieselmann, A., Böckermann, M., Sorbi, M. & Pietrowsky, R. (2017). The effects of an Internet-based imagery rehearsal intervention: A randomized controlled trial. *Psychotherapy and Psychosomatics*, 86, 231–240. <https://doi.org/10.1159/000470846>.

Gieselmann, A., Ophey, M., de Jong-Meyer, R., & Pietrowsky, R. (2012). An induced emotional stressor differentially decreases subjective sleep quality in state-oriented but not in action-oriented individuals. *Personality and Individual Differences*, 53, 1007–1011. <https://doi.org/10.1016/j.paid.2012.07.020>

Personal Contribution: I was in charge of the experimental design, obtained a positive vote of the Ethics Committee, and conducted the data analyses. I made up the manuscript and was in charge of the review process. Together with the second author, I collected the data presented in the article and analyzed the polysomnographies.

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Publication no. 2

Gieselmann, A., de Jong-Meyer, R., & Pietrowsky, R. (2018). Sleep quality and self-regulation: The interaction between strong state orientation and high neuroticism predicts poor sleep quality. *Somnologie*, 22, 2–9. <https://doi.org/10.1007/s11818-017-0137-1>

Personal Contribution: I was in charge of the experimental design, data collection, and data analyses. I made up the manuscript, and was in charge of the review process.

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Gieselmann, A., de Jong-Meyer, R., & Pietrowsky, R. (2012). Kognitive und körperliche Erregung in der Phase vor dem Einschlafen: Die deutsche Version der Pre-Sleep-Arousal Scale (PSAS) [Cognitive and physical arousal in the pre-sleep phase. The German version of the Pre-Sleep Arousal Scale (PSAS)]. *Zeitschrift für Klinische Psychologie und Psychotherapie*, 41, 73–80. <https://doi.org/10.1026/1616-3443/a000134>

Personal Contribution: I was in charge of the experimental design, data collection, and data analyses. I made up the manuscript, and guided the paper through the review process.

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Gieselmann, A., & Pietrowsky, R. (2016). Treating procrastination chat-based versus face-to-face: An RCT evaluating the role of self-disclosure and perceived counselor's characteristics. *Computers in Human Behavior*, 54, 444–452. <https://doi.org/10.1016/j.chb.2015.08.027>

Personal Contribution: I was in charge of the experimental design and the treatment manual that was applied, obtained the approval of the Ethics Committee, and supervised the interventions that were conducted by students that were shortly before finishing their Master's level in psychology. I analyzed the data, made up the manuscript, and was in charge of the review process.

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Gieselmann, A. & Pietrowsky, R. (2019). The effects of brief chat-based and face-to-face psychotherapy for insomnia: A randomized waiting list controlled trial. *Sleep Medicine*, 61, 63-72. <https://doi.org/10.1016/j.sleep.2019.03.024>

Personal Contribution: I was in charge of the experimental design and the treatment manual that was applied, obtained the approval of the Ethics Committee, conducted the diagnostics with the patients concerned, and supervised their therapies. I analyzed the data and prepared the manuscript.

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Gieselmann, A., Podleschka, C., Rozental, A., & Pietrowsky, R. (2020). Communication formats and their impact on patient perception and working mechanisms: A mixed-methods study of chat-based vs. face-to-face psychotherapy for insomnia. *Behavior Therapy*. <https://doi.org/10.1016/j.beth.2020.06.001>

Personal Contribution: I was in charge of the data analysis plan and I conducted the quantitative data analyses. Together with the second author, I conducted the qualitative content analyses and prepared the manuscript.

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Gieselmann, A., Böckermann, M., & Pietrowsky, R. (2015). Internetbasierte Gesundheitsinterventionen: Eine Evaluation aus der Perspektive von Patienten vor und während ambulanter Psychotherapie [Internet-based health interventions. Evaluation from the perspective of patients before and in outpatient psychotherapy]. *Psychotherapeut*, 60, 433–440. <https://doi.org/10.1007/s00278-015-0038-3>

Personal Contribution: I was in charge of the experimental design, guided the data collection, and analyzed the data. I made up the manuscript, and guided the paper through the review process.

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Publication no. 8

Mathes, J., Renvert, M., Eichhorn, C., Freiherr von Martial, S., **Gieselmann, A.**, & Pietrowsky, R. (2018). Offender-nightmares: Two pilot studies. *Dreaming*, 28, 140–149. <https://doi.org/10.1037/drm0000084>

Personal Contribution: I was involved in the coding system that was applied to evaluate the nightmares. Further, I revised and edited former versions of the manuscript.

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<https://psycnet.apa.org/doiLanding?doi=10.1037%2Fdrm0000084>

Gieselmann, A., Ait Aoudia, M., Carr, M., Germain, A., Gorzka, R., Holzinger, B., Kleim, B., Krakow, B., Kunze, A. E., Lancee, J., Nadorff, M. R., Nielsen, T., Riemann, D., Sandahl, H., Schlarb, A. A., Schmid, C., Schredl, M., Spoormaker, V. I., Steil, R., van Schagen, A. M., Wittmann, L., Zschoche, M., & Pietrowsky, R. (2019). Etiology and treatment of nightmare disorder: State of the art and future perspectives. *Journal of Sleep Research*, 28, e12820. <https://doi.org/10.1111/jsr.12820>

Personal Contribution: The paper summarizes results of a symposium organized by Reinhard Pietrowsky and me. It was built upon text blocks formulated by the respective co-author. Personally, I wrote the section on diagnostics, epidemiology, I summarized the basic principle of the Affect Network Dysfunction model, and the different treatment options. Further, I was involved in the revision of every section. The major challenge was to coordinate exchanges and discussions between the different experts. Finally, I was in charge of the review process.

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Publication no. 10

Schmid, C., Steil, R. & **Gieselmann, A.** (2019). Die Albtraumstörung und ihre Behandlung. *report psychologie*, 44, 6–9.

Personal Contribution: I responded to a first draft made by the first author and added information on symptoms, diagnostics, and epidemiology of nightmare disorder. Further, I was responsible for the section on lucid dreaming as one treatment option. Then, I revised and edited former versions of the manuscript.

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Publication no. 11

Mathes, J., **Gieselmann, A.**, & Pietrowsky, R. (2020). When a dream turns into a nightmare: Due to negative dream content or to negative appraisal? *International Journal of Dream Research*, 13, 209-214. <https://doi.org/10.11588/ijodr.2020.2.72231>

Personal Contribution: I was involved in the coding system that was applied to evaluate dreams and nightmares. Then, I discussed and assisted with data analysis. Further, I revised and edited former versions of the manuscript.

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Publication no. 12

Böckermann, M., **Gieselmann, A.**, & Pietrowsky, R. (2014). What does nightmare distress mean? Factorial structure and psychometric properties of the Nightmare Distress Questionnaire (NDQ). *Dreaming*, 24, 279–289. <https://doi.org/10.1037/a0037749>

Personal Contribution: Together with the first author, I developed the study plan, helped with the acquisition of patients diagnosed with nightmare disorder, analyzed the data and wrote down method section and result section, discussed and revised the manuscript.

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Gieselmann, A., Elberich, N., Mathes, J., & Pietrowsky, R. (2020). Nightmare distress revisited: Cognitive appraisal of nightmares according to Lazarus' transactional model of stress. *Journal of Behavior Therapy and Experimental Psychiatry*, 68, 101517. <https://doi.org/10.1016/j.jbtep.2019.101517>

Personal Contribution: Together with the second author, I developed the application of the model formulated by Lazarus on nightmare distress. I conducted the data analyses, formatted the manuscript, made up the manuscript, and submitted the manuscript to a journal on psychological assessment where it is under review.

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Böckermann, M., **Gieselmann, A.**, Sorbi, M., & Pietrowsky, R. (2015). Entwicklung und Evaluation einer internetbasierten begleiteten Selbsthilfe-Intervention zur Bewältigung von Albträumen [Development and evaluation of an Internet-based guided self-help intervention for coping with nightmares]. *Zeitschrift für Psychiatrie, Psychotherapie & Psychosomatik*, 63, 117–124. <https://doi.org/10.1024/1661-4747/a000230>

Personal Contribution: Together with the first author, I helped revising the first version of the Internet-based self-intervention, helped with the acquisition of patients diagnosed with nightmare disorder, analyzed the data, discussed and revised the manuscript.

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Gieselmann, A., Böckermann, M., Sorbi, M. & Pietrowsky, R. (2017). The effects of an Internet-based imagery rehearsal intervention: A randomized controlled trial. *Psychotherapy and Psychosomatics*, 86, 231–240. <https://doi.org/10.1159/000470846>

Personal Contribution: Together with the second author, I made up the experimental design of the trial and helped with the acquisition of patients diagnosed with nightmare disorder. I was in charge of the data analyses, wrote the methods section and the results section, extensively revised a first draft of the introduction and the discussion, and guided the paper through the review process.

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