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A Cognitive Theory and Therapy for Chronic Insomnia

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The aim of this article is to review progress toward developing a cognitive theory of and therapy for chronic insomnia. The article will begin with a brief overview of cognitive behavior therapy for insomnia (CBT-I), the current treatment of choice, which devotes approximately one session to cognitive therapy. On the basis of (a) the conclusion from a recent review of psychological treatments for insomnia that cognitive therapy has received insufficient attention and evaluation and (b) the evidence that cognitive therapy for a range of other psychological disorders has improved treatment outcome, the remainder of the article describes another approach to the treatment of insomnia: cognitive therapy for insomnia (CT-I). This treatment is derived from a cognitive model that specifies five processes that function to maintain insomnia: worry (also known as cognitive arousal), selective attention and monitoring, distorted misperception of sleep and daytime deficits, unhelpful beliefs about sleep, and counterproductive safety behaviors. The aim of the treatment is to reverse all five maintaining processes during both the day *and* the night.

Keywords: cognitive therapy; insomnia; sleep; attention; beliefs

Since the groundbreaking work of Aaron T. Beck and his colleagues (e.g., 1976), cognitive theories and therapies have led to a much enhanced understanding of a wide range of psychological disorders (see Salkovskis, 1996). The aim of the present article is to review progress toward developing a cognitive theory of, and therapy for, chronic insomnia. The article will begin with a brief overview of what is currently regarded as the treatment of choice for insomnia; cognitive behavior therapy for insomnia or CBT-I. CBT-I is a multicomponent treatment that is conducted over 4 to 10 weekly sessions (Morin & Espie, 2003), with one of these sessions typically devoted to cognitive therapy. The remainder of the article will describe a different approach to the treatment of insomnia. This will be referred to as cognitive therapy for insomnia, or CT-I. CT-I is driven by one cognitive model of the maintenance of insomnia and every session is devoted to using core cognitive therapy skills to reverse the cognitive maintaining processes specified by the cognitive model.

What Is Insomnia?

Insomnia is a chronic difficulty that involves problems getting to sleep, maintaining sleep, or waking in the morning not feeling restored. It is one of the most prevalent psychological health

problems, reported by 10% of the population (Ancoli-Israel & Roth, 1999). The consequences for the sufferer are severe and include functional impairment, work absenteeism, impaired concentration and memory, and increased use of medical services (Roth & Ancoli-Israel, 1999). Further, there is evidence that insomnia significantly heightens the risk of having an accident (Ohayon, Caulet, Philip, Guilleminault, & Priest, 1997) and the risk of subsequently developing another psychological disorder, particularly an anxiety disorder, depression, or substance-related disorder (Harvey, 2001; McCrae & Lichstein, 2001). It is therefore regarded as a serious public health problem.

In this paragraph a distinction is drawn between the original cause/s or precipitant/s of insomnia (i.e., the distal cause/s) and the causes that are active at the time the client is seeking treatment (i.e., the proximal cause/s). The former will be referred to as precipitant/s and the latter as maintaining process/es. Although in this paper we are primarily concerned with the processes that *maintain* insomnia, rather than the precipitating factors, it is emphasized that the precipitants are likely to be heterogeneous and may include physical disorders, substances, circadian rhythm disturbances, psychological factors, and poor sleep habits (Bootzin, Manber, Perlis, Salvio, & Wyatt, 1993). The reason for focusing on the maintaining processes is that the relative contribution of precipitating and maintaining processes is likely to vary over the course of a disorder with the precipitating processes (e.g., a life event) making their greatest contribution at the point of onset but then waning, and the maintaining processes taking hold, and progressively increasing, as the disorder becomes established (Spielman, Caruso, & Glovinsky, 1987). Accordingly, it is typically the maintaining processes that need the most attention during treatment.

Comorbidity

Everyone who engages in clinical practice knows that insomnia can occur as the sole presenting problem or as a condition that is comorbid with another psychiatric or medical disorder. It is suggested that conceiving of the insomnia as merely epiphenomenal to the comorbid disorder is unwise for two reasons. First, the evidence indicates that insomnia serves as a risk factor for, and can be causal in, the development and/or maintenance of the comorbid disorder (for review see Harvey, 2001; McCrae & Lichstein, 2001). Second, substantial evidence is accruing to suggest that insomnia that is comorbid with another psychiatric or medical disorder does not necessarily remit with the treatment of the so-called primary disorder (Smith, Huang, & Manber, in press).

Cognitive Behavior Therapy for Insomnia (CBT-I)

The components of CBT-I have been described in full elsewhere (Morin & Espie, 2003; Perlis, Junqquist, Smith, & Posner, in press). It is a multicomponent treatment that involves several of the following components: stimulus control, sleep restriction, sleep hygiene, paradoxical intention, relaxation therapy, and cognitive restructuring for unhelpful beliefs about sleep. The components are administered over 4 to 10 weekly sessions in either individual (e.g., Edinger, Wohlgemuth, Radtke, Marsh, & Quillian, 2001a) or group (e.g., Espie, Inglis, Tessier, & Harvey, 2001; Morin, Colecchi, Stone, Sood, & Brink, 1999) format. The formal cognitive therapy component of CBT-I, typically administered in one session, involves attempting to alter faulty beliefs about sleep by education and discussion about sleep requirements, the biological clock and the effects of sleep loss on sleep-wake functions (e.g., Edinger et al., 2001a). Other techniques used in some CBT-I treatment protocols include imagery training (using six visualized common objects, such as a candle and an hourglass, immediately prior to sleep; Woolfolk & McNulty, 1983) and thought stopping (the patient is instructed to yell "stop" subvocally every time an

obsessive rumination occurs). Further, Morin and Espie (2003) recommend teaching the patient to identify negative automatic thoughts and then replace them with more rational and realistic alternative thoughts.

There is no doubt that CBT-I is an effective treatment as indicated by two meta-analyses (Morin, Culbert, & Schwartz, 1994; Murtagh & Greenwood, 1995) and a review conducted by the Standards of Practice Committee of the American Academy of Sleep Medicine (Chesson et al., 1999; Morin, Hauri, et al., 1999). Our desire to develop a new treatment for insomnia arose because whilst significant progress has been made the field is not, as yet, at a point where patients can be offered a maximally effective psychological treatment. This is indicated by the significant proportion (19% to 26%) of patients who do not improve following CBT-I and by the average overall improvement among those who do respond being only 50% to 60% (Morin et al., 1994; Murtagh & Greenwood, 1995). Although this degree of change is statistically significant it is not enough to convincingly move the average patient into a state where we would call them, and they would call themselves, good sleepers.

Why Develop a Cognitive Therapy Treatment?

Why did we seek to develop, in an attempt to maximize treatment outcome, a *cognitive therapy* treatment? There were two reasons. First, the detailed review of psychological treatments for insomnia, conducted by the American Academy of Sleep Medicine, concluded that cognitive therapy had received insufficient evaluation (Chesson et al., 1999; Morin, Hauri, et al., 1999). Second, a review of treatment outcomes for a range of other psychological disorders shows that over the past 2 decades highly effective, highly efficient and highly acceptable treatments have been developed when researchers have (a) developed and empirically tested a theory that aims to specify the cognitive processes that maintain the disorder and then (b) developed a cognitive treatment that aims to reverse the maintaining processes specified in the model (Salkovskis, 2002). This approach, sometimes referred to as the process of clinical science, has resulted in impressive improvements in treatment outcome for a range of psychological disorders; for just one example see the panic disorder literature where the cognitive theory (Clark, 1986) guided empirical investigations testing the assumptions and predictions of the theory (Clark, 1997, for review) which, in turn, led to the development of a highly effective cognitive therapy treatment for panic disorder (e.g., Arntz & van den Hout, 1996; Clark et al., 1994). Cognitive therapy is not only highly effective, with effect sizes surpassing their behavioral counterparts for several disorders (e.g., Clark et al., 2003; Ehlers et al., 2003), but it has the important benefit of being highly acceptable to patients, indicated by patient acceptability ratings and low rates of dropout from treatment (Salkovskis, 1996).

Link Between CBT-I and CT-I

A thorough analysis of the similarities and differences between CBT-I and CT-I is beyond the scope of this article except to note that the two therapies have only one treatment component in common, a component that aims to tackle unhelpful beliefs about sleep, as introduced to the field by Morin (1993). But, as will be described below, the method for addressing unhelpful beliefs about sleep in CT-I is different from the method used in CBT-I. CT-I emphasizes individually formulated behavioral experiments to test unhelpful beliefs, whereas CBT-I emphasizes verbal techniques, especially education. However, I note at the outset that CT-I is still in the process of being empirically validated. This is in contrast to CBT-I where there is an existing strong evidence base.

Theoretical Basis for CT-I

The cognitive model of insomnia that formed the basis for the development of CT-I (Harvey, 2002a) draws heavily from, and owes much to, cognitive models of other psychological disorders (e.g., Beck, 1976; Clark, 1997; Salkovskis, 1996), as well as from previous theoretical work highlighting the importance of cognitive processes to insomnia (e.g., Borkovec, 1982; Espie, 2002; Lundh, 1998; Morin, 1993; Perlis, Giles, Mendelson, Bootzin, & Wyatt, 1997). According to the conceptualization put forward in the model, insomnia is maintained by a cascade of cognitive processes that operate at night *and* during the day. The five key cognitive processes that comprise the cascade are worry (accompanied by arousal and distress), selective attention and monitoring, misperception of sleep and daytime deficits, dysfunctional beliefs, and counterproductive safety behaviors.

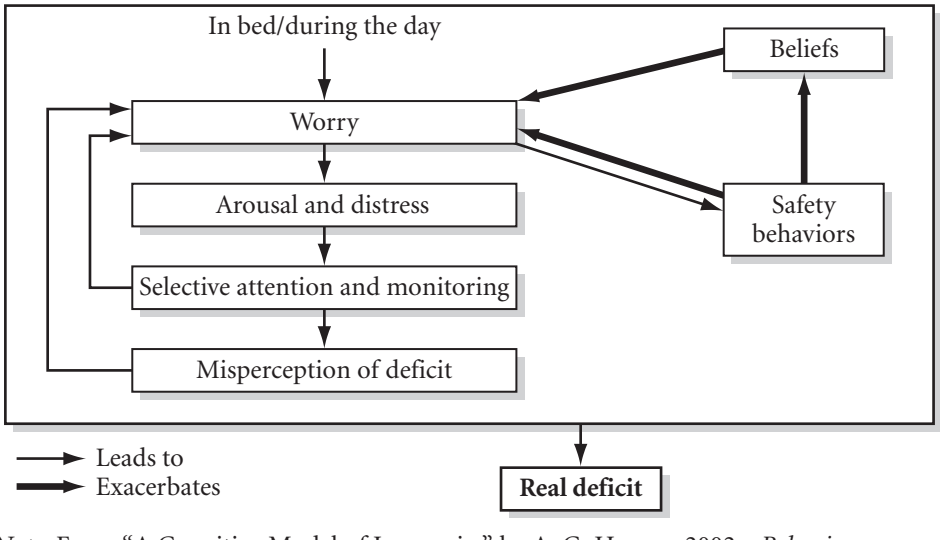
Before describing the model in more detail there are two important points to note. First, the cognitive processes proposed to operate at night are proposed to apply equally to difficulty getting to sleep at the beginning of the night and to difficulty getting back to sleep after waking during the night and to waking too early in the morning. Second, the maintaining processes described can "kick in" at any point in the model and as a consequence of either daytime or nighttime experiences.

The Night

The five cognitive processes, and the way they interrelate (as graphically depicted in Figure 1) will now be described as they apply to the night.

Worry

It is well documented that people with insomnia lie in bed worrying about a range of topics including not being able to get to sleep (e.g., Harvey, 2000; Wicklow & Espie, 2000). The cognitive



Note: From "A Cognitive Model of Insomnia," by A. G. Harvey, 2002a, *Behaviour Research and Therapy, 40,* pp. 869–893. Reprinted with permission.

Figure 1. A cognitive model of the maintenance of insomnia (the cascade of processes depicted is proposed to apply to both the day *and* the night).

model suggests that worry activates the sympathetic nervous system (the so-called "fight or flight response") thereby triggering physiological arousal, and distress. This combination of worry, arousal, and distress plunges the individual into an anxiety state, a state that is antithetical to falling asleep and staying asleep (Espie, 2002).

Selective Attention and Monitoring

The experimental literature in cognitive psychology indicates that when anxious, there is a narrowing of the stimuli in the environment that are attended to (Easterbrook, 1959) and attention is preferentially directed toward potential threats (Dalgleish & Watts, 1990). Hence, the model suggests that the anxious state leads people with insomnia to narrow their attention and selectively attend to or monitor for sleep-related threats that might be internal stimuli (e.g., bodily sensations) and/or external stimuli (e.g., the environment for noise that might prevent sleep onset). This selective attention and monitoring is automatic in the sense that it consumes minimal attentional resources and can happen without conscious decision making (Kahneman, 1973). As monitoring for threat increases the chance of detecting random and meaningless cues that can then be misinterpreted (Clark, 1999) and the aroused state means that there is likely to be an abundance of body sensations present to be detected, monitoring is likely to provide further cause for worry. Hence, a vicious cycle is established, as indicated in Figure 1 by the feedback arrow from "selective attention and monitoring" to "worry."

Misperception

The inclusion of the *misperception* box in Figure 1 aims to account for the finding that many people with insomnia inadvertently overestimate how long it takes them to fall asleep and underestimate how long they sleep in total (e.g., Bonnet, 1990) by suggesting that insomnia is like most other psychological disorders in being characterized by "distortions in reality" (Beck, 1976, p. 218). To give some examples of misperception in other psychological disorders; people with anorexia nervosa think they are overweight when actually they are underweight and people with panic disorder think they are having a heart attack when actually they are experiencing symptoms of anxiety. In a similar way, perhaps processes are operating that somehow trick patients with insomnia into overestimating the extent to which their sleep is inadequate. But note that a tendency to misperceive sleep does not preclude the presence of a *real* sleep deficit (the section titled "real sleep deficit" will elaborate on this point).

The three mechanisms by which patients may get tricked into overestimating the extent of the deficit in sleep are suggested to be

1. Worry
2. Selective attention and monitoring, and
3. Anxiety (the combination of worry, arousal, and distress).

The rationale for the first prediction, that worry serves to trigger misperception of sleep, is drawn from the robust finding in the time perception literature that time seems longer when the number of units of information processed per unit of time increases (Thomas & Cantor, 1975). On this basis, it has been proposed that worry whilst trying to get to sleep may function to distort the perception of how long it is taking to get to sleep (Borkovec, 1982). Evidence is accruing to support this first prediction (e.g., Tang & Harvey, 2004a). The rationale for the second prediction, that selective attention and monitoring contributes to misperception of sleep, is conceived on the basis that monitoring for sleep-related threat increases the chance of detecting random and meaningless cues that would otherwise pass unnoticed. When patients with insomnia detect these cues they misinterpret them as indicative of threat (Clark, 1999; Salkovskis & Bass, 1997) which, in turn, contributes to misperception of sleep and/or daytime functioning. To

give an example, when "innocuous cues (e.g., a momentary lapse in memory, trouble concentrating when reading morning email) are interpreted as 'signs' of inadequate performance resulting from a lack of sleep, the myriad of possible influences on feelings and levels of alertness are discounted" (p. 883; Harvey, 2002a).

A third possibility, somewhat related to the second, is that insomnia is characterized by exconsequentia reasoning or emotional reasoning (Arntz, Rauner, & van den Hout, 1995). That is, patients with insomnia draw faulty conclusions about a situation because they base their judgment on how they feel. In other words, danger is inferred from the subjective feelings. For example, when a patient with insomnia notices feeling tired during the daytime they tend to use this subjective feeling to conclude that they must not have slept well during the previous night (when the feeling may have arisen from being bored or needing to eat).

It should be noted that if an individual *perceives* they have not slept adequately a further cause for worry is established (see the feedback arrow from "misperception of deficit" to "worry" in Figure 1). Further, if an individual wakes up in the morning *believing* they have had inadequate sleep, this is likely to contribute to the cascade of daytime cognitive processes, as will be discussed below.

Unhelpful Beliefs About Sleep and Safety Behaviors

Finally, it is proposed that there are two additional exacerbating processes. First, unhelpful beliefs about sleep are likely to fuel worry (Morin, 1993). For example, if you believe you need more than 8 hours of unbroken sleep each and every night to function adequately during the day it is likely that you will worry about your daytime functioning (because most people find that getting 8 hours of unbroken sleep is impossible to achieve). Second, in an attempt to cope with the escalating anxiety caused by the processes described, people with insomnia often make use of safety behaviors (Salkovskis, 1991), such as drinking alcohol to reduce anxiety and promote sleep onset. A safety behavior is an overt or covert action that is adopted to avoid feared outcomes. The problem is that these behaviors (a) prevent the person experiencing disconfirmation of their unrealistic beliefs and (b) may make the feared outcome more likely to occur (Salkovskis, 1991). Drinking alcohol to promote sleep onset is a classic safety behavior in that although it may promote initial sleep onset, it results in more awakenings and more disturbed sleep during the night (Roehrs & Roth, 2001). That is, drinking alcohol before bedtime makes the feared outcome (poor quality sleep) more likely to occur.

The Day

A novel aspect of the cognitive model is that the processes operating during the day are considered to be *equally* important to the processes that operate at night. Indeed, parallel processes to those described for the night are proposed to also operate during the day (as depicted in Figure 1). Specifically, on waking people with insomnia often worry that they haven't obtained sufficient sleep. This worry, in turn, triggers arousal and distress, selective attention and monitoring for sleep-related threats, misperception, and the use of counterproductive safety behaviors. Each of these processes serves to maintain the insomnia; worry, arousal, and distress are likely to interfere with satisfying and effective daytime performance; selective attention and monitoring are likely to increase the detection of ambiguous cues (e.g., feelings of tiredness) that are then misinterpreted ("I mustn't have slept enough") leading to misperception of daytime deficits. Further, the use of safety behaviors can contribute to distress and worsening of sleep, as well as preventing disconfirmation of unhelpful beliefs. For example, canceling appointments at work (the safety behavior) will prevent disconfirmation of the belief that "if I feel tired at work the best way to cope is to cancel my appointments" and will have unfortunate consequences such as getting behind at work, which is likely to further increase anxiety.

A Real Sleep Deficit

As depicted at the bottom of Figure 1, it is suggested that these processes culminate in a real sleep deficit. Three points are relevant here. First, when a patient suffers from a real sleep deficit it is conceived to be the product of escalating anxiety, which is not conducive to sleep onset (Espie, 2002) nor to effective daytime performance (Eysenck, 1982). Second, misperception of sleep and a real sleep deficit can coexist. It is not uncommon for a patient with insomnia to report sleeping only 2 hours a night. However, after completing an objective assessment of their sleep over multiple nights (which were described by the patient as "typical"), it is discovered that they are actually sleeping 4 hours. In this example, the client is misperceiving their sleep *and* suffering from a serious real sleep deficit. Third, for the occasional client who *thinks* they are not getting enough sleep but, in reality, are sleeping sufficiently (a problem known as sleep state misperception), the cognitive model emphasizes that such clients are at grave risk of getting trapped into becoming progressively more absorbed by and anxious about their sleep problem. The unfortunate consequence of this is that they are at high risk of developing a real sleep deficit.

Empirical Status of the Cognitive Model

In this section the empirical evidence for the proposals described in the previous section are reviewed.

Worry[1]

Among the most empirically supported of the cognitive processes specified by the model is the importance of worry whilst trying to get to sleep (Harvey, 2002b, 2004). The range of methods used to index worry whilst trying to get to sleep include questionnaire/interview (e.g., Fichten et al., 1998; Harvey, 2000; Lichstein & Rosenthal, 1980), voice-activated tape recorder (Nelson & Harvey, 2003; Wicklow & Espie, 2000), correlational methods (e.g., Fichten et al., 1998; Hall et al., 2000), and experiments (e.g., Hall, Buysse, Reynolds, Kupfer, & Baum, 1994; Tang & Harvey, 2004a). The results converge on the finding that worry serves to maintain sleep disturbance at night.

A new topic, just starting to attract research attention, relates to the finding that some thought control strategies, like thought suppression, are important contributors to the maintenance of worry and sleep disturbance (Bélanger, Morin, Gendron, & Blais, 2005; Harvey, 2003a; Harvey & Payne, 2002; Ree, Harvey, Blake, Tang, & Shawe-Taylor, in press). There may also be differences in the *form* of thought. For example, thinking in images (i.e., in pictures, like a photograph or video) versus thinking in verbal thought (i.e., in words and sentences) (Nelson & Harvey, 2002, 2003).

While the importance of worry during the night continues to receive research attention, to the best of my knowledge, the prediction that unwanted sleep-related thought is an important cognitive process during the day remains to be tested. However, common descriptors of the daytime state of patients with insomnia include proneness to anxiety, worry, neuroticism, obsessionality, dysphoria, hypervigilance, and tension (Edinger, Stout, & Hoelscher, 1988; Hauri & Fisher, 1986; Kales & Kales, 1984; Morin, 1993). These descriptors are broadly consistent with the suggestion that worry about sleep is not restricted to the nighttime among patients with insomnia.

Selective Attention to and Monitoring for Sleep-Related Threats

Investigations of selective attention toward sleep-related threats have been reported using a range of methodologies including daily diaries, experimenter-administered interview (Harvey, 2002a; Neitzert Semler & Harvey, 2004a), questionnaires (Neitzert Semler & Harvey, 2004b), and

experimental manipulations of monitoring (Tang & Harvey, 2004a). Together, the findings indicate that attention to internal and external sleep-related threat is higher among individuals with insomnia relative to good sleepers. Another methodology, using computerized information processing tasks, also highlights a role for selective attention to threat in insomnia (e.g., Taylor, Espie, & White, 2003). The advantage of this approach is the decreased reliance on self-report.

Misperception

Many research studies have demonstrated a discrepancy, for patients with insomnia, between (a) their subjectively reported sleep and daytime functioning and (b) the objectively estimated sleep and daytime function (the subjective report indicates worse sleep and daytime function) (e.g., Chambers & Keller, 1993; Lamarche & Ogilvie, 1997; Mendelson, James, Garnett, Sack, & Rosenthal, 1986; Mercer, Bootzin, & Lack, 2002). One possible account of this discrepancy is that the measures employed to date are not sufficiently sensitive. An alternative possibility, as already highlighted, is that the vicious cycles described operate to trap the individual into becoming progressively more absorbed by, and anxious about, the sleep problem. This then culminates, over time, in a real sleep deficit. This proposal is consistent with the view that misperception of sleep, in its most severe form, may be considered a "prodromic or transitional state" in the development of objective insomnia (Salin-Pascual, Roehrs, Merlotti, Zorick, & Roth, 1992, p. 904) but large longitudinal studies are required to empirically evaluate this proposed link.

Unhelpful Beliefs

Following the pioneering work of Morin (1993), the evidence that patients with insomnia hold more unhelpful and inaccurate beliefs about sleep, relative to individuals without insomnia, continues to accrue (e.g., Edinger, Wohlgemuth, Radtke, Marsh, & Quillian, 2001b; Espie, Inglis, Harvey, & Tessier, 2000; Morin, 1993). A compelling recent finding is that reductions in unhelpful beliefs following treatment are associated with better treatment outcome (Edinger et al., 2001b; Morin, Blais, & Savard, 2002). Hence, there is strong evidence for the importance of the role of unhelpful beliefs about sleep in insomnia.

Safety Behaviors

As already highlighted, a safety behavior is an action taken in an attempt to prevent a feared outcome. The negative consequences of maladaptive coping strategies, such as excessive time in bed and drinking alcohol before bed, have been targeted within the sleep hygiene component of CBT-I for some time (e.g., Bootzin, 1972; Perlis et al., 1997). The concept of safety behaviors used in CT-I overlaps with these previously identified coping strategies, but differs in that in CT-I safety behaviors include both overt (e.g., canceling work appointments or social activities) and covert (e.g., suppression of worrisome thoughts) actions by the patient, and they are proposed to have a direct link with dysfunctional beliefs about sleep (Salkovskis, 1991). To give an example of the latter point, if a patient believes he/she needs 8 hours of sleep each night the safety behaviors adopted in an attempt to obtain 8 hours might include (a) doing something active close to bedtime to promote tiredness (but exercise too close to bedtime can make it hard to get to sleep) and (b) canceling social engagements in the evening (but this will leave more time for worrying about sleep).

In two independent samples (Harvey, 2002c; Ree & Harvey, 2004a) we have begun the process of delineating the safety behaviors employed by individuals with insomnia and have used this information to develop the Sleep-Related Behaviors Questionnaire (SRBQ). The use of safety behaviors, as measured by the SRBQ, is higher in poor sleepers relative to good sleepers (Ree & Harvey, 2004b).

Causal Relationships

In the preceding sections, evidence was reviewed indicating that patients with insomnia exhibit the cognitive processes specified by the cognitive model. But it is important to test the proposed causal relations; that these cognitive processes have an adverse impact on sleep and daytime functioning and that the proposed links between the processes hold up under empirical scrutiny. With this goal in mind, and consistent with the predictions of the model, there is evidence from experimental studies that monitoring for sleep-related threat (Tang, Harvey, & Schmidt, 2004) and worry (Tang & Harvey, 2004a) serve to fuel misperception of sleep. Further, to explore the potential adverse consequences of misperception of sleep for daytime functioning we conducted an experimental manipulation of the perception of sleep immediately on waking. This involved patients with primary insomnia being allocated to receive either positive or negative feedback about their sleep, immediately on waking, on 3 consecutive mornings (Neitzert Semler & Harvey, in press). The positive feedback was that last night's sleep was good quality. The negative feedback was that last night's sleep was poor quality. Objective sleep on each of the 3 nights was estimated by actigraphy and did not differ across the 3 nights or the two feedback conditions. The key result was that negative feedback was associated with more negative thoughts, more sleepiness, more monitoring for sleep-related threat, and greater use of safety behaviors during the day, relative to positive feedback. These results are consistent with the proposal that subjective perception of sleep immediately on waking triggers a cascade of daytime maintaining processes and has adverse consequences for daytime functioning (Harvey, 2002a).

Although this handful of studies provide support for some of the causal links proposed by the model, many of the proposed links remain to be empirically tested.

Reversing the Maintaining Processes: Cognitive Therapy for Insomnia

Over the past 6 years my colleagues[2] and I have been engaged in a process of developing a new cognitive treatment (CT-I), designed to reverse the cognitive processes predicted by the model to maintain insomnia. Before describing CT-I it is emphasized that the core cognitive therapy skills of Socratic questioning, guided discovery, and behavioral experiments are essential for the effective administration of this treatment, as are the structural aspects of cognitive therapy such as agenda setting, homework, eliciting feedback at the end of each session (an opportunity to resolve misunderstandings) and at the beginning of the next session (to check the patient's perception and understanding of the previous session). The bedrock of the cognitive treatment described here, like other cognitive therapies, is a therapeutic relationship that is characterized by a strong therapeutic alliance and collaboration; the therapist and the patient work as a team as they seek to develop, together, an "ever-evolving formulation" of the difficulties faced by the patient (Beck, 1995, p. 5). Many excellent texts on these core aspects of cognitive therapy are available including Beck (1995), Bennett-Levy and colleagues (2004), and Padesky and Greenberger (1995).

CT-I will be described in three phases: conceptualization, reversing the maintaining processes, and consolidation/relapse prevention. While the ordering of the treatment components in Phase 2 is broadly suggestive of the order in which they are typically completed, it is important to be sensitive to the many differences between patients as to which processes are most critical to the maintenance of their distress and to address these processes at an earlier stage of treatment.

Phase 1 (1–2 Sessions)

Following several other successful cognitive therapy treatments (e.g., Clark et al., 1994; Ehlers et al., 2003), we begin by deriving a version of the cognitive model that is personalized for the patient. We derive two models; one for the night and one for the day. The decision as to which of the models to derive first is made by asking the patient whether *the night* or *the day* is causing them the most difficulty/is most distressing. During the development of these personalized cognitive models we aim to build up a picture of how the daytime and nighttime processes identified are linked to, and feed into, each other. Each model is based on a detailed discussion of a recent *specific* night of poor sleep (which forms the basis for the nighttime model) and a recent *specific* day characterized by daytime tiredness and/or other problems associated with sleep (which forms the basis for the daytime model). Note that only part of the model will be derived in Phase 1; we do not introduce the role of (a) dysfunctional beliefs and (b) misperception of sleep and daytime performance until Phase 2. The impact of these two is more effectively demonstrated by experience. Figure 2 presents one example of a nighttime model derived with one insomnia patient. As is evident, this is a very simplified version of the cognitive model presented in Figure 1 (the format is based on Morrison, 2001).

So in Phase 1 we aim to complete an individualized formulation of the client's difficulties; this is not a time to intervene, instead it is a time to be curious and develop, with the client, an understanding of how their difficulties are maintained. After drawing out the two personalized cognitive models we take the opportunity to introduce the basic tenets of cognitive therapy; that thoughts lead to powerful emotions and unhelpful behaviors and that both make it difficult to get back to sleep. It is important to link the presentation of these ideas directly back to the two personalized cognitive models that have just been derived. Finally, the patient and the therapist brainstorm ways they can intervene in the vicious cycles described within the two personalized cognitive models. So this phase forms the basis for and provides the rationale for the subsequent

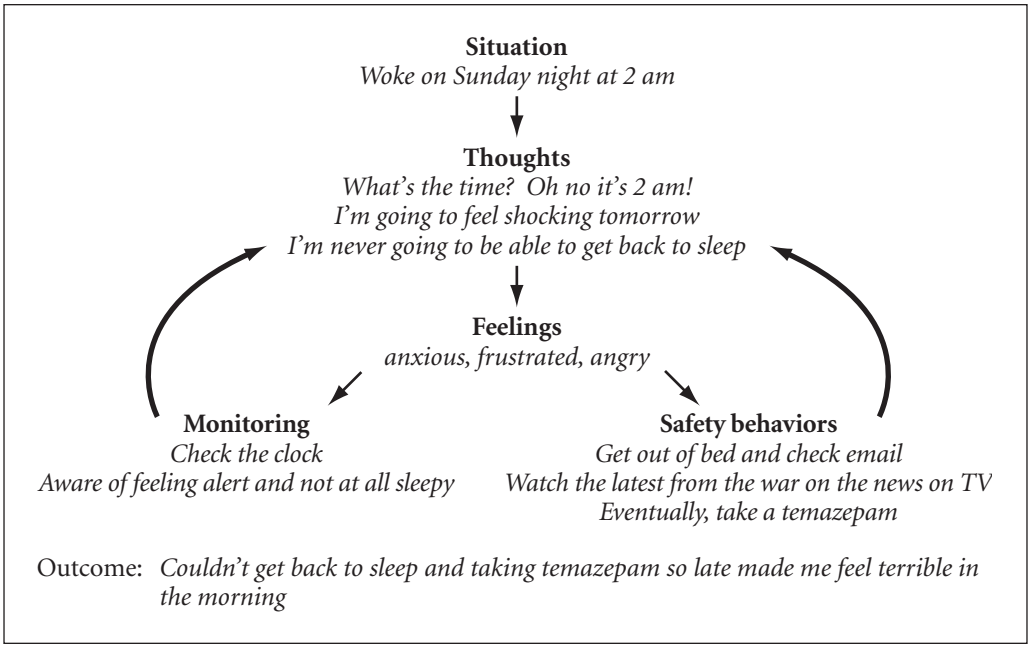


Figure 2. An example of a personalized version of the cognitive model for the night.

intervention. It also provides the patient with hope that improvement is realistic by simply changing one or more of the core parts of the vicious cycles.

Phase 2 (4–6 Sessions)

The aim in these sessions is to reverse each of the processes that were identified in Phase 1 as maintaining the sleep disturbance, and also to look for opportunities to introduce the two additional maintaining processes that were not introduced in Phase 1: misperception of sleep and unhelpful beliefs about sleep. The use of tailored *behavioral experiments* is core to this phase. Because verbal techniques like directly questioning the logical basis of thoughts and beliefs are typically not enough, behavioral experiments are used. Behavioral experiments are "planned experiential activities, based on experimentation or observation, which are undertaken by patients in or between . . . therapy sessions. Their design is derived directly from a cognitive formulation of the problem, and their primary purpose is to obtain new information which . . . [includes] . . . contributing to the development and verification of the cognitive formulation" (p. 8; see Bennett-Levy et al., 2004). Some examples of the behavioral experiments we find to be particularly useful are described below (for others see Ree & Harvey, 2004b).

Misperception

It does not work to try to *verbally* convince patients that sleep is hard to estimate but it is incredibly powerful to set up, and draw attention to, the patient's own experience of difficulty perceiving sleep. The latter is done by behavioral experiments and by taking up natural opportunities that emerge to explore this topic.

One of the first behavioral experiments we do in the treatment aims to reduce misperception of sleep. This involves demonstrating the discrepancy between an objective estimate of sleep (measured via actigraphy or polysomnography) and the patient's own subjective estimate (measured via the sleep diary) (see Tang & Harvey, 2004b, for a full description).

If an objective measure of sleep is not available, we use a number of other methods. First, we give the patient a handheld counter to place under their pillow to test beliefs like "I wake up more than 30 times each night" (in the morning the handheld counter is only pressed three times). Second, we watch out for natural opportunities to explore the topic. That is, patients will often report a misperception experience. Here is an example:

> *Something weird happened last night. I honestly thought I'd hardly slept at all but when I told my wife over breakfast this morning she laughed and said that I was fast asleep, and breathing heavily, all night—she knew because she wasn't feeling well so she was awake a lot. You know, I believe her because she's very supportive of me and wouldn't say I was asleep if I wasn't.*

These kinds of experiences are a perfect time for the therapist to raise the possibility that there is a distinction between how much sleep you *feel* you get and how much you *actually* get and that it is easy to feel you get less sleep than you actually get. We then introduce the notion of sleep inertia here by saying something like:

> *On waking, most of us, most mornings have a period of between 3 minutes and 20 minutes when we feel dazed, sleepy, and 'out of it.' This is a normal transitional state called* sleep inertia. *Sleep inertia is a term that simply refers to the transition between a state of sleep and a state of wakefulness. It is not a pleasant feeling, especially if you have to rush around and get ready for work or get your children off to school. But it is a normal transitional state and doesn't necessarily mean that you had a poor night of sleep. It is easy to misinterpret these sensations as evidence of poor sleep.*

We also emphasize that sleep is incredibly difficult to reliably perceive because sleep onset is defined by the absence of memories. A third method we have found to be effective is that, for 1 week we ask the patient to record, immediately on waking, how they slept and in a separate diary,

to be completed before going to bed, to record how their day was (how tired they felt, how productive they were, how satisfied they were). Comparing these two diaries in the next session virtually always leads to the discovery that poor sleep does not always lead to a bad day. This then leads to a discussion of how we might account for this. One of the accounts that we gently raise here is that it can be hard to estimate sleep and maybe the patient got more sleep than they thought they got. If this possibility is rejected by the patient we leave the issue but look for opportunities to come back to it when natural examples arise (as described above).

Other behavioral experiments are conducted to test potential misperceptions during the day. For example, several of our patients have been concerned that poor sleep noticeably affects their appearance. To test this belief we designed a behavioral experiment in which the patient, for 1 week, keeps a sleep diary in which they record their total sleep time each morning. Each morning they also take a closeup digital photograph of themselves. Before embarking on the experiment the therapist asks the patient to describe, in as much detail as possible, exactly how their physical appearance is affected. This is written down as the prediction to be tested. For one patient the prediction was: in the morning following the worst night of sleep this week I will have dark rings in a half-moon shape under my eyes, the wrinkles on my face will be deeper, and I'll be as white as a ghost. In the session following the week of the photographs being taken the photographs were downloaded and shown one at a time. The patient tried to pick the photograph in which they looked most tired by rating each one for (a) darkness of the rings under their eyes, (b) appearance of wrinkles, and (c) color of face. There has been no occasion when the patient has been able to correctly identify the photograph taken on the morning following the worst night of sleep. Hence, this behavioral experiment has constituted a stunning disconfirmation of the belief that poor sleep affects one's appearance.

Worry

We begin the intervention for worry by defining negative automatic thoughts (NATs) and then teaching the patient to monitor for, catch, and evaluate their negative automatic thoughts, using the method described by Beck (1995; see also Padesky & Greenberger, 1995). In this exercise we ask the patient to pick sleep-related negative automatic thoughts as examples to work on, although we suggest to the patient that it is a helpful procedure for worrisome thoughts relating to any topic. Themes that emerge from the patient observing and recording their negative automatic thoughts are then used to detect unhelpful beliefs that serve to maintain the insomnia. These can then be tested with a behavioral experiment.

The above procedure on its own, is rarely sufficient for managing worry so several other approaches are required, three of which will now be described.

1. Ask what the patient does to manage unwanted worrisome thought. Typically they will report that they try to stop worrying by "blanking my mind" or "trying to stop all thought." For these clients it is helpful to conduct a behavioral experiment within the session to demonstrate the adverse consequences of thought suppression. This involves conducting Wegner's (1989) white bear experiment, as a behavioral experiment, within the session. The patient is asked to close their eyes and try to suppress all of their thoughts relating to white bears (the therapist does this too). After a couple of minutes stop and share how successful your suppression attempts were (or more typically, were not!). This provides a springboard to discuss alternative thought management strategies like letting the thoughts come (i.e., the opposite of suppression) or gently directing attention to interesting and engaging imagery. Then, for homework during the subsequent week, we often set up one or more behavioral experiments, trying various alternative thought control strategies (for further details see Harvey & Payne, 2002; Nelson & Harvey, 2003).
2. On the basis of a recent paper by Watkins and Baracia (2002), we watch out for patients asking themselves "why questions" (e.g., Why am I not sleepy? Why are my thoughts rac-

ing? Why do I always feel so sleepy?). These often become evident either (a) during the initial case formulation when the thoughts the patient is having are elicited or (b) when the content of worry episodes is unpacked. "Why questions" rarely have definite answers and so asking them tends to lead to *more* distress. For example, if a person were to ask "why can't I control my sleep?" the chances are that he/she would not find a simple, definite answer, and would end up feeling as if there was no solution to the problem, heightening anxiety and distress. In these cases we set up behavioral experiments so that the patient can discover whether asking "why" questions is helpful or unhelpful in terms of generating solutions and in terms of the emotional consequences.

3. We also look out for positive beliefs about worrying in bed. The importance of positive beliefs about worry is drawn from the generalized anxiety disorder literature, which suggests that pathological worry may be, at least partly, maintained because the individual believes that worry will lead to positive consequences (see Wells, 1995). To help identify the positive beliefs held by patients with insomnia we ask our patients with insomnia to complete a questionnaire that lists a range of positive and negative beliefs about worry (Harvey, 2003b). Examples of the positive beliefs included in this questionnaire are: that worrying whilst trying to get to sleep helps me get things sorted out in my mind and is a way to distract myself from worrying about even more emotional things, things that I don't want to think about. If we discover that patients hold these beliefs we use Socratic questioning and behavioral experiments to examine and test their validity.

Selective Attention and Monitoring

A combination of within-session behavioral experiments and asking the patient to complete the Sleep Associated Monitoring Index (SAMI; Neitzert Semler & Harvey, 2004b) are used to introduce the concept of monitoring and to raise the patient's awareness of what is often an automatic process (we liken it to a virus checker on a computer that checks for threats to the smooth running of the computer but which we're often not aware of operating in the background). Then we use "monitoring for monitoring" (a diary for recording monitoring and its consequences) and behavioral experiments to discover the extent to which there are adverse consequences associated with monitoring. To give one example, to test predictions such as "when I wake up at night I need to know what the time is or else I won't get back to sleep" we plan a clock-monitoring experiment. This typically involves the patient volunteering to monitor the clock whilst trying to get to sleep, and during awakenings, for 2 nights and comparing their experience to placing the clock out of view for 2 nights. Whenever we have used this experiment the result is the same; the patient discovers that monitoring the clock increases worry and anxiety and makes it more difficult to fall back to sleep.

Once patients are aware of the types of monitoring that they engage in, the consequences of monitoring, and the associated meaning, the interventions to reduce or stop monitoring involve actively directing attention outward or turning the radar off. Behavioral experiments comparing self-focus and external focus (for people who monitor their body sensations) or comparing far external focus (e.g., sounds in the street and in the house) and close external focus (e.g., the feeling of the soft sheets next to the skin) (for people who monitor the outside environment whilst trying to get to sleep) provide opportunities to practice purposively directing attention and observe the consequences for how they feel. Also, we spend time establishing the link between monitoring and negative thoughts and encourage the patient to catch and evaluate negative thoughts that follow monitoring. For example, triggered by monitoring, the thought "my body feels achy and fatigued so I must not have got enough sleep" can be evaluated using the negative automatic thoughts form so that a broader view can be considered such as "my body feels achy and fatigued because I'm unfit at the moment and because I'm feeling bored and unmotivated with the work I'm trying to do."

Safety Behaviors

Although safety behaviors will have been identified and dealt within the treatment components already described, it is important to identify remaining safety behaviors and use behavioral experiments to establish whether the safety behavior is helpful or unhelpful (see Ree & Harvey, 2004b, for examples).

Unhelpful Beliefs About Sleep

We use the Dysfunctional Beliefs about Sleep Scale (DBAS; Morin, 1993) and themes that emerge from the work on negative automatic thoughts to identify remaining unhelpful beliefs (some of which will have already been tackled in earlier treatment sessions). In contrast to the methods of CBT-I, which typically involve providing education about sleep and using this to verbally challenge unhelpful beliefs, we address the remaining beliefs with behavioral experiments (see Ree & Harvey, 2004b, for examples).

Our "fear of poor sleep" behavioral experiment seems to be one of the most important. This experiment is done toward the end of treatment when the patient feels they have developed an ability to manage the daytime consequences of a poor night.[3] This experiment involves actually creating one "poor night" of sleep (e.g., choosing to sleep 6.5 hours for the patient who thinks he/she needs 8 hours). The point is that by this stage of treatment this behavioral experiment has been done by accident on several occasions (i.e., those sessions when a patient has come in and said "you know I only slept 6 hours last night and I actually feel OK today"). However, these experiences still haven't always fundamentally changed the belief that "I need 8 hours of sleep to cope" and may even have been dismissed as a fluke or attributed to some other occurrence (e.g., I coped because I drank a lot of coffee). So by actually choosing to sleep less, for just one night, the possibility of dismissing the information is eliminated but a core belief is challenged. Before attempting this experiment it is important to decide whether the patient wishes to go to bed later or to set the alarm earlier or some combination of both. We then plan fun activities to do during this time to keep awake and to make the experiment a memorable experience. Those who choose to wake earlier in the morning might decide to have a leisurely breakfast in bed with their partner or take more time reading the morning newspaper. Of course, we take care not to choose a night prior to a day when the patient is driving or would be at risk if they are tired. With a careful rationale, planning, and support (e.g., phone calls and/or emails), most patients will give this experiment a try and benefit enormously.

Linking the Night and the Day

Toward the end of Phase 2, we often find it is necessary to more explicitly tie together the skills developed for managing daytime tiredness and for maximizing a good night of sleep. This is important because up to now the treatment has tended to focus on teaching one skill at a time so there needs to be time to practice explicitly combining them. The "fear of poor sleep" experiment, just described, is a very useful way to achieve this goal as it involves combining all the skills during the day to combat the effects, on the day, of the poor night of sleep.

Phase 3 (1–2 Sessions)

In the final phase of treatment session, time is also devoted to consolidating treatment gains and to relapse prevention. The patient and therapist complete a detailed written summary of the discoveries made throughout the treatment to reinforce what has been learned. They also set goals to ensure continued progress.

Conclusion

A cognitive theory of, and therapy for, chronic insomnia has been outlined. The cognitive theory specifies five processes that function to maintain insomnia, namely worry, selective attention and monitoring, misperception of sleep and daytime deficits, unhelpful beliefs about sleep, and counterproductive safety behaviors. The aim of the treatment is to reverse all five maintaining processes during the day *and* the night. While progress has been made in testing the theoretical model, and in developing a treatment designed to reverse the maintaining processes specified by the model, much further research remains to be done. In particular, further empirical studies are required to test predictions of the model, especially the proposed links with sleep and daytime symptoms and the proposed links between the processes. It is envisaged that a variety of converging methods (e.g., questionnaire studies, interview studies, experimental studies) will be needed to achieve this goal.

Notes

1. Note that in the context of insomnia "worry" has not been distinguished from "rumination" (see Harvey, in press, for a full discussion of this issue). Hence, in the insomnia literature the two terms tend to be used synonymously.

2. I gratefully acknowledge the staff and graduate students at the Oxford Centre for Insomnia Research and Treatment for their important contributions to the development and ongoing testing of the treatment described here. In particular, thanks to Melissa Ree, Ann Sharpley, Nicole Tang, Lindsay Browning, Christina Neitzert Semler, Alison Bugg, Katriina Burnet, and Kathleen Stinson. I would also like to acknowledge the important contributions of David M. Clark and Ann Hackmann.

3. Methods used to manage the daytime consequences of poor sleep include "energy-generating" behavioral experiments and conducting surveys of friends and family to discover that some daytime tiredness, particularly in the postlunch dip period, is experienced by everyone, even people who are good sleepers (for further description see Ree & Harvey, 2004b).

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