



CLINICAL REVIEW

Assessing cognitive processes related to insomnia: A review and measurement guide for Harvey's cognitive model for the maintenance of insomnia



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ARTICLE INFO

Article history:

Received 31 March 2014

Received in revised form

19 November 2014

Accepted 20 November 2014

Available online 29 November 2014

Keywords:

Sleep

Insomnia

Cognitive model

Measurement

Review

SUMMARY

Cognitive processes play an important role in the maintenance, and treatment of sleep difficulties, including insomnia. In 2002, a comprehensive model was proposed by Harvey. Since its inception the model has received >300 citations, and provided researchers and clinicians with a framework for understanding and treating insomnia. The aim of this review is two-fold. First, we review the current literature investigating each factor proposed in Harvey's cognitive model of insomnia. Second, we summarise the psychometric properties of key measures used to assess the model's factors and mechanisms. From these aims, we demonstrate both strengths and limitations of the current knowledge of appropriate measurements associated with the model. This review aims to stimulate and guide future research in this area; and provide an understanding of the resources available to measure, target, and resolve cognitive factors that may maintain chronic insomnia.

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Introduction

Sleep is a necessary and important part of human existence [1,2], and people who sleep poorly may be subject to poor social, occupational and educational functioning [2,3]. Insomnia is the most common sleep difficulty [4,5], defined as difficulty initiating and/or maintaining sleep or waking up too early, which disrupts functioning [6,7]. Between 25 and 37% of adults frequently experience at least one insomnia symptom, with 5–10% diagnosed with an insomnia disorder [5,8,9]. Comorbidity is common, including substance abuse, anxiety, and depression [10,11], which can be a consequence, risk, or even contributing factor [12]. Understanding factors that may contribute to, and maintain insomnia, is of high clinical relevance.

It is widely acknowledged that cognitive processes play a central role in the maintenance of insomnia. Targeting cognitions is thus important for the effective treatment of the disorder [13]. Several key models of insomnia have highlighted the role of various

cognitive processes (e.g., the psychobiological inhibition model [14]; the sleep interfering-interpreting process model [15]; and the microanalytic model [16]). The most widely cited¹ of these models is the cognitive model of insomnia [17], which will be the focus of this review. This model of insomnia has been largely accepted by both researchers and clinicians working in the field of sleep disorders. Most notable is the model's focus on what maintains, rather than what may cause, insomnia [17,18]. That is, the model is said to focus on those features of insomnia likely to be active when a person seeks help for the disorder, and thus the features that would be important to target in psychological interventions (see [18]). The focus on factors maintaining insomnia has particular clinical relevance given evidence that people with insomnia are unlikely to seek professional help until their insomnia has become chronic [19].

When first proposed in 2002, Harvey's model was based on an extensive review of the insomnia, sleep and anxiety fields (e.g., [16,20,21]), providing an accessible and cohesive understanding of the role of cognitions in the maintenance of insomnia. The model proposed several mechanisms, said to perpetuate insomnia, and placed importance both on nighttime and daytime processes [17].

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¹ Based on citation rates presented on Scopus database, September 2014.

List of abbreviations

ACT	actigraphy
CBT-I	cognitive behaviour therapy for insomnia
CI	catastrophising interview
DBAS	dysfunctional beliefs and attitudes about sleep
DISRS	daytime insomnia symptom response scale
DPT	dot-probe task
FFT	flicker fusion task
GCTI	Glasgow content of thoughts inventory
GSES	Glasgow sleep efficiency scale
PSAS	pre-sleep arousal scale
PSG	polysomnography
REM	rapid eye movement
SAAQ	sleep anticipatory anxiety questionnaire
SCT	stroop colour task
SRBQ	sleep related behaviour questionnaire

While *excessive negatively toned cognitive activity* (e.g., worry, rumination) lies at the centre of the model, other components either exacerbate or lead to other factors, that together result in a perceived sleep deficit. Other components include i) safety behaviours, ii) dysfunctional beliefs, iii) arousal and distress, iv) selective attention and monitoring, and v) distorted perception of deficit (see Fig. 1).

The role of cognitions in the maintenance of insomnia is particularly highlighted through the acknowledgement of the efficacy of cognitive behaviour therapy for insomnia (CBT-I). CBT-I is considered an efficacious treatment for insomnia, with long term benefits and few side effects [22]. However, when dismantling CBT-I, the evidence for cognitive therapy alone is not yet strong [23]. Consequently, it is important to fully investigate each factor in the cognitive model, and pathways between them, in the hope that current cognitive therapy will be more potent. This can be made easier if clinicians and researchers are made aware of what measures target cognitive factors. To assist in stimulating further research in this field, the aims of this review were two fold. First, we have provided an update on the past 5 y of research, since recommendations were made to improve knowledge of the cognitive processes related to insomnia in a 2009 review [24]. While we acknowledge other factors, outside of those proposed in this model that may impact on insomnia (most notably depression), this review specifically focuses on providing an update on evidence of those factors highlighted in Harvey's model of insomnia. Second, we have also provided an overview of the key measures for each component of Harvey's cognitive model for the maintenance of insomnia [17]. The intention is to make clinicians cognizant of current evidence-based measures to use during CBT-I, and to highlight important areas for future research on these measures and the components of Harvey's model.

Components of the cognitive model of insomnia: the current state of evidence

Excessive negatively toned cognitive activity

This factor lies at the centre of Harvey's model, with all components being related to it (see Fig. 1; [17]). Several correlational and experimental studies support an association between negative cognitions and sleep disturbance (e.g., [24–28]). Two cognitive styles which have received attention in the sleep and insomnia field are rumination and worry. While both involve repetitive

negatively-valenced thinking, their content varies. Rumination is where one makes attributions for their disturbed mood or symptoms (e.g., “because I did not sleep last night I cannot concentrate today”; [29,30]). Worry involves repetitive thinking about the future and consequences (e.g., “because I feel anxious I will not be able to sleep tonight”; [31]). While there is robust evidence of the impact of worry, and particularly worry about sleep, on exacerbating sleep difficulties in poor sleepers and in insomnia, rumination has received less attention, with little focus on comparing the processes [31,32]. Investigations of rumination in analog samples showed higher levels of rumination in poor, compared to good, sleepers, as well as a general association between high levels of rumination and poorer sleep [28,33]. A 2010 study was the first to explore, and directly compare, worry and rumination in a clinical sample of over 200 adults with primary insomnia [31]. Interestingly, while both processes uniquely contributed to poor sleep, it was high levels of rumination, but not worry, that was associated with poorer sleep quality, sleep efficiency and more time awake after sleep onset, in insomnia. Indeed, rumination impacted on insomnia above any impact of depression [31]. While the lack of association between worry and sleep was surprising, the authors acknowledged that this may have resulted from the measure used (Penn State worry questionnaire; [34]) being too broad and thus not related to sleep disturbance [31]. Consequently, future research comparing these two processes remains pertinent.

Catastrophising is a third cognitive process to receive more attention in recent years, and is defined by compounding catastrophic thoughts (e.g., “because I cannot sleep I will not function and never get a job”) [25]. Although catastrophising was not explicitly highlighted in Harvey's original model [17], Espie's psychobiological inhibition model identifies catastrophising as a meaningful contributor [14]. Compared to good sleepers, those diagnosed with an insomnia disorder report more catastrophic thinking about the consequences of sleep (e.g., “If I don't get enough sleep my job will be on the line”; [35]), and experience increased anxiety and discomfort, which also provided support for cognitive activity leading to arousal and distress (discussed below; see Fig. 1; [17]). While Harvey's model does not explicitly distinguish between these various cognitive styles, based on evidence of each contributing to sleep, there is clearly a need for research to focus on extending our knowledge of how these processes uniquely impact on sleep. Further developing our understanding of these processes would be particularly beneficial for improving the potency of CBT-I.

Measures of cognitive activity. Table 1 presents a summary of the psychometrics and clinical utility of measures assessing key components of Harvey's cognitive model of insomnia. Reviewed measures include the Glasgow content of thoughts inventory (GCTI; [36]), the sleep anticipatory anxiety questionnaire (SAAQ; [37]), the cognitive subscale of the pre-sleep arousal scale (PSAS; [38]), the Glasgow sleep effort scale (GSES; [39]), and the daytime insomnia symptom response scale (DISRS; [29,31,40,41]). To date, many do not provide clinical cut-offs (e.g., SAAQ, PSAS), significantly reducing their clinical utility, and some would benefit from replication to confirm their validity and reliability (e.g., the GSES and the DISRS). Further, it would be beneficial to explore whether clinical cut-offs could differentiate factors that maintain insomnia versus, for example, other sleep or mental health disorders [31].

Moreover, there is some debate about what is actually measured by some of these tools (i.e., worry vs. rumination vs. catastrophising) [31]. Many questionnaires provide a general measure of negative cognitive activity, rather than individual cognitive processes. Currently, the only measure to focus on insomnia-specific rumination is the DISRS [29]. This measure was created based on

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