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Cognitive processes and their association with persistence and remission of insomnia: Findings from a longitudinal study in the general population

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ABSTRACT

Aim: Insomnia is a common health problem that affects about 10% of the population. The purpose of this investigation was to examine the association between cognitive processes and the persistence and remission from insomnia in the general population.
Methods: In a longitudinal design, 2333 participants completed a survey on night time and daytime symptoms, and cognitive processes. Follow-up surveys were sent out six months and 18 months after the first assessment. Participants were categorised as having persistent insomnia, being in remission from insomnia or being a normal sleeper.
Results: Cognitive processes distinguished between people with persistent insomnia and normal sleepers. Specifically, worry, dysfunctional beliefs, somatic arousal, selective attention and monitoring, and safety behaviours increased the likelihood of reporting persistent insomnia rather than normal sleep. For people with insomnia, more worry about sleep at baseline predicted persistent insomnia but not remission later on. Lower selective attention and monitoring, and use of safety behaviours over time increased the likelihood of remission from insomnia. In general, these results remained, when psychiatric symptoms and medical complaints were added to the models.
Conclusions: The findings support that certain cognitive processes may be associated with persistence and remission of insomnia. Clinical implications are discussed.

Insomnia is a common sleep disorder that affects 9–12% of the population worldwide, with up to a third of the population suffering from insomnia symptoms (Ford & Kamerow, 1989; Ohayon & Reynolds III, 2009). Insomnia is defined by difficulties initiating or maintaining sleep, or early morning awakenings with inability to fall asleep. The sleep disturbance causes distress or an impaired ability to function in important areas, such as social or work related contexts (American Psychiatric Association, 2000, 2013). Insomnia can be acute or persistent (Ellis, Gehrman, Espie, Riemann, & Perlis, 2012). Whilst a recent definition of acute insomnia emphasises that it is caused by life events or distress at the current situation (Ellis et al., 2012), the literature on persistent insomnia describes perpetuating factors more directly related to sleep and the sleep situation, such as sleep habits, heightened arousal, and dysfunctional beliefs about sleep (e.g. Buysse, Germain, Hall, Monk, & Nofzinger, 2011; Espie, 2002; Harvey, 2002; Lundh & Broman, 2000; Morin, 1993; Perlis, Giles, Mendelson, Bootzin, & Wyatt, 1997). Insomnia is associated with high costs through healthcare appointments and sleep enhancing drugs (Daley, LeBlanc, Grégoire, & Savard, 2009), as well as work absenteeism (Linton & Bryngelsson, 2000) and an increased prevalence of vehicle accidents at work and after work (Léger, Massuel, Metlaine, & The SISYPHE Study Group, 2006). Insomnia also constitutes a well-established increased risk of developing depression for both adults (Ford & Kamerow, 1989) and adolescents (Breslau, Roth, Rosenthal, & Andreski, 1996). Insomnia is thus associated with severe consequences for the individual as well as high costs for society. Hence it is important to investigate possible maintaining processes.

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Cognitive processes of insomnia

Many attempts have been made to explain what drives chronic insomnia (e.g. Buysse et al., 2011; Espie, 2002; Harvey, 2002; Lundh & Broman, 2000; Morin, 1993; Perlis et al., 1997). The following cognitive processes have been suggested across various models of insomnia: worry, dysfunctional beliefs, arousal, selective attention and monitoring, and safety behaviours (maladaptive habits).

Worry is theorised to maintain insomnia; both worry specifically related to sleep problems or consequences of poor sleep as well as more general worries (Espie, 2002; Harvey, 2005; Morin, Stone, Trinkle, Mercer, & Remsberg, 1993). Worry is thought to disturb sleep by triggering arousal, and to be maintained by dysfunctional beliefs and selective attention (discovering more reasons to be worried) (Harvey, 2005). Studies have shown that it is possible to increase sleep latency by inducing worry (Gross & Borkovec, 1982), or shorten it by targeting worry through an intervention (Carney & Waters, 2006).

Dysfunctional beliefs about sleep include unhelpful beliefs about the amount of sleep needed every night, or fearful ideas about what will happen to one's health and ability to function in different areas in life, if insomnia persists. Dysfunctional beliefs are believed to trigger worry about sleep, both during day and night (Morin et al., 1993), and motivate the use of safety behaviours in an attempt to avoid feared outcomes (Harvey, 2005). People with insomnia have more dysfunctional beliefs about sleep than normal sleepers (Carney et al., 2010). The results of a longitudinal study indicated that dysfunctional beliefs about sleep were related to persistent insomnia and poor sleep over time (Jansson & Linton, 2007) and a cross-sectional study showed that dysfunctional beliefs were positively associated with the use of safety behaviours (Woodley & Smith, 2006). A review of mediating factors in insomnia treatment showed that cognitive behaviour therapy for insomnia (CBT-I) was consistently associated with reductions in dysfunctional beliefs, and that these reductions were associated with improvements on both subjective and objective sleep outcomes (Schwartz & Carney, 2012).

Arousal is a core feature in many insomnia models, and it has been conceptualised as somatic, cognitive and cortical (e.g. Buysse et al., 2011; Espie, 2002; Harvey, 2002; Lundh & Broman, 2000; Morin, 1993; Perlis et al., 1997). Hyperarousal models of insomnia propose that conditioned cognitive and somatic arousal are perpetuating factors of insomnia (Perlis et al., 1997; Riemann et al., 2010). The bed, the bedroom or bedtime rituals are conditioned to arousal from the unhelpful practice of spending excessive time in bed while awake. *Cognitive arousal* is experienced as increased cognitive activity (e.g. a racing mind). *Somatic arousal* could elicit symptoms similar to those of a "fight or flight" response from the sympathetic nervous system, for example tense muscles, rapid heartbeat, and a restless/nervous sensation in the body. There are also studies supporting local CNS activation: elevated *cortical arousal* during sleep, and this is believed to set the stage for sleep-state misperception through increased sensory processing (hearing noises), information processing (being able to think), and memory encoding (Drummond, Smith, Orff, Chengazi, & Perlis, 2004; Perlis et al., 1997; Riemann et al., 2010). These phenomena, which normally would be inhibited during sleep, give the impression of being awake rather than being asleep. Arousal has been linked to the maintenance of insomnia in longitudinal studies (Jansson & Linton, 2007; Jansson-Fröjmark, Lundquist, Lundquist, & Linton, 2008) and higher arousability is a predictor of insomnia incidence (LeBlanc et al., 2009). Although arousal may strictly speaking not be a cognitive concept, it has been associated with cognitive processes in cognitive models of insomnia and warrants investigation together with cognitive processes (Espie, 2002; Harvey, 2002).

Selective attention and monitoring for threats refers to the narrowing of the focus of attention and scanning of anything that could be perceived as a threat to sleep and regards both external stimuli such as noises or monitoring the clock to keep track of time, and internal stimuli such as tensions of the body. Based on the assumption that normal sleep is automatic and effortless, selective attention is believed to disturb the transition between wake and sleep (Espie, Broomfield, MacMahon, Macphee, & Taylor, 2006). Experimental studies have found support for attentional bias in insomnia. For example, instructions to monitor a clock during the night increased sleep onset latency and worry for people with poor sleep and good sleep alike (Tang, Schmidt, & Harvey, 2007), and people with insomnia have displayed attentional bias towards sleep-related stimuli in several experimental paradigms (Marchetti, Biello, Broomfield, Macmahon, & Espie, 2006; Spiegelhalder, Espie, & Riemann, 2009; Woods, Marchetti, Biello, & Espie, 2009; Woods, Scheepers, Ross, Espie, & Biello, 2013).

Safety behaviours are subtle behaviours people use in an attempt to avoid feared outcomes (Salkovskis, 1991). In the case of insomnia, common fears include the fear of not falling asleep or fear of negative consequences of poor sleep, such as failing at work or becoming ill due to sleeplessness. Safety behaviours can be overt and, for example, include going to bed very early to allow for plenty of time to fall asleep, cancelling appointments after a poor night as they are perceived as too energy consuming, and napping during daytime in order to feel more energised. Covert safety behaviours, such as attempts to suppress unwanted thoughts while trying to go to sleep, are also possible. Safety behaviours may be helpful in the short term but often have undesirable long-term effects, as they may interfere with the kind of regular sleep schedule that would promote healthy sleep (Morin, 1993). Another disadvantage of safety behaviours is that they prevent dysfunctional beliefs from being tested and corrected.

To summarise, according to several insomnia models, there are maintaining cognitive processes that hinder normal sleep and worsen sleep problems by creating vicious cycles. It is already known from cross-sectional studies that people with insomnia experience cognitive processes to a larger degree than people without insomnia. For example, people with insomnia experienced worry, dysfunctional beliefs, arousal, selective attention and monitoring, and safety behaviours to a significantly larger extent, compared with people with poor sleep, who in turn scored higher than normal sleepers (Jansson-Fröjmark, Harvey, Norell-Clarke, & Linton, 2012). However, a gap in current knowledge is the association between insomnia and cognitive processes over time.

A little over ten years ago it was noted that almost all epidemiological studies of insomnia in the general population were cross-sectional, although exceptions should be noted (e. g. The Zurich Study: Vollrath, Wicki, & Angst, 1989), and that much was unknown regarding the development of insomnia (Ohayon, 2002). In The Zurich Study (Vollrath et al., 1989), insomnia increased the risk of future insomnia, and longitudinal research since then has also pointed towards the chronic nature of insomnia, finding insomnia episodes to be a risk factor for future insomnia and that insomnia complaints often persist over time (LeBlanc et al., 2009; Morin et al., 2009). Prospective studies, investigating differences between those who develop chronic insomnia and those who do not, have found that several aspects of physical and mental health predicted insomnia (LeBlanc et al., 2009; Singareddy et al., 2012). Premorbid reports of people who would later develop insomnia showed that they reported poorer general health, more pain, higher arousability, and more depression and anxiety (LeBlanc et al., 2009). Data from the Penn State Sleep Cohort showed that those who reported poor mental health were more likely to develop chronic insomnia (Singareddy et al., 2012). The longitudinal studies