



Original Article

Sleep-related cognitive processes, arousal, and emotion dysregulation in insomnia disorder: the role of insomnia-specific rumination



Laura Palagini ^{a,*}, Umberto Moretto ^a, Liliana Dell'Osso ^a, Colleen Carney ^b

^a Department of Clinical and Experimental Medicine, Psychiatric Unit, University of Pisa, School of Medicine, Pisa, Italy

^b Department of Psychology, Ryerson University, Toronto, ON, Canada

ARTICLE INFO

Article history:

Received 8 August 2016

Received in revised form

1 October 2016

Accepted 4 November 2016

Available online 19 November 2016

Keywords:

Cognitive-somatic arousal

Trait arousal

Rumination

Emotion dysregulation

ABSTRACT

Objective: Insomnia-specific rumination has presented in subjects with insomnia. Research has identified hyperarousal as a key factor, with both trait and state components. It has been shown that emotion dysregulation also plays a role in insomnia. Hence, the aim was to investigate how insomnia rumination is associated with both trait- and state-dependent arousal and emotion dysregulation in insomnia.

Methods: Sixty-eight subjects with insomnia disorder (DSM-5) and 36 good sleepers were evaluated using: Insomnia Severity Index (ISI), Daytime Insomnia Symptom Response Scale (DISRS), Arousal Predisposition Scale (APS), Pre-sleep Arousal Scale (PSAS), and Difficulties in Emotion Regulation Scale (DERS). Univariate and multivariate regression analyses and mediation analyses were performed.

Results: Subjects with insomnia (F_{41} , mean age 50.2 ± 10) presented higher scores than good sleepers (F_{22} , mean age 49.7 ± 14) in all the scales (ISI, DISRS, APS, PSAS, DERS; $p < 0.0001$). Insomnia rumination was directly correlated with trait (APS, $B = 0.22$, $p < 0.0001$) pre-sleep state arousal (PSAS cognitive $B = 0.22$, $p < 0.0001$, PSAS somatic $B = 0.24$, $p < 0.0001$) and emotion dysregulation ($B = 0.5$, $p = 0.03$). It mediated the association between trait and pre-sleep state hyperarousal ($Z = 3.3$, $p = 0.0008$), the bidirectional association between cognitive and somatic arousal ($p = 0.02$), and the association between trait hyperarousal and emotion dysregulation ($Z = 2.3$, $p = 0.04$).

Conclusions: In insomnia, specific rumination is related to both trait predisposition to arousal and to state-dependent arousal. It is also related to emotion dysregulation. Insomnia-specific ruminative response style may modulate the complex association between trait- and state-dependent arousal factors and arousal and emotion regulation in insomnia. In this framework, a broad range of cognitive processes may be considered when dealing with subjects with insomnia: the use of rumination-oriented psychological strategies could be important.

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1. Introduction

Chronic insomnia may affect almost one-third of the adult population [1,2] and it is a prevalent health problem. Insomnia is involved in the development of cognitive impairment [3,4], it is an independent risk factor for work disability and reduced work performance [5], and it is associated with high direct and indirect costs for the healthcare system and society [6,7]. It is related to a broad range of comorbid conditions, including

psychiatric and neurodegenerative disorders, as well as neuroendocrine and cardiovascular diseases [8–16]. Studying the mechanisms involved in the development and maintenance of insomnia should be a priority in order to better improve prevention measures, treat insomnia, and its comorbid conditions.

Physiological, cognitive, and emotional hyperarousal have been identified as the key factors in insomnia, across the 24-h day [17,18]. It may include both trait vulnerability to hyperarousal that refers to a pattern of excessive responsiveness to stimuli during wakefulness [19–24], and state construct. State dependent arousal specifically regards the pre-sleep cognitive and somatic hyperarousal, while attempting to fall asleep [17,18,25–29]. It has been hypothesized that the interaction between trait and state factors may contribute to the development and maintenance of insomnia [17,18,27–30].

* Corresponding author. Department of Clinical and Experimental Medicine, Psychiatric Unit, University of Pisa, School of Medicine, Via Roma 67, 56100, Pisa, Italy.

E-mail addresses: lpalagini@tiscali.it, lpalagini@ao-pisa.toscana.it (L. Palagini).

Research has also supported a role for cognitive processes in the development and maintenance of insomnia. Previous studies have shown that subjects with insomnia have more unhelpful sleep-related beliefs than good sleepers [26–28,31]. According to Harvey's Cognitive Model of Insomnia [27] those with sleep difficulties can suffer from repetitive thinking throughout the 24-hours period. This mental activity has been described to focus on unhelpful beliefs and attitudes about sleep, worries about sleep, or rumination on the possible consequences of insomnia [27,31–36] which may interfere with emotion regulation and arousal, thus contributing to the perpetuation of insomnia [26,27,31–36].

While certain thought processes, such as worry and unhelpful beliefs, have been more widely explored within the context of insomnia [27,28,34,35,37] rumination has not received the same degree of attention with respect to its role in sleep disturbance.

Rumination refers to a repetitive thought process focusing on the cause of current distress and has been typically described within the context of mood disorders [38,39]. It has been suggested that rumination is an important transdiagnostic factor between insomnia and mood disorders [40]. Although, an increased interest has recently been developing in rumination in the context of insomnia [31–37]; a specific tool has been assessed to detect this process in insomnia [37], but little is known about the association between insomnia-specific rumination and trait or pre-sleep state arousal.

Recently, rumination has been regarded as a dysfunctional emotion regulation strategy related to a reduced ability to successfully regulate negative emotions [41]. The ability to adaptively regulate emotions is crucial for healthy functioning, and deficits in emotion regulation appear to be pivotal in the development and maintenance of various forms of psychopathology, including insomnia [27–29,42–49].

Emotion dysregulation refers to difficulties in modulating emotional experiences in a way that is responsive to both the immediate context of the situation and the long-term objectives of the individual [42,45]. Studies have found support for emotion dysregulation as both a risk and maintaining factor for mental disorders including insomnia [42–49], which contributed to hyperarousal [50]. A number of studies have found support for a deleterious relationship between insomnia and emotion regulation [27–29,42–49]. This has led theorists to propose that sleep disturbance and emotion dysregulation might be mutually maintaining factors [47,51]. It has been hypothesized that hyperarousal in insomnia arises from behaviors associated with sleep-related cognitions which may perpetuate the symptoms of insomnia [27–31], play a key role in the management of emotions and, in turn, elevate arousal and interfere with sleep [27,32,43,44,47]. Despite this evidence, little is known about the possible association between insomnia-specific rumination and emotion regulation in subjects with insomnia.

Hence, the primary objective of this study was to evaluate the possible association between insomnia-specific rumination and trait/pre-sleep state arousal. The secondary objective was to evaluate the possible association between insomnia-specific rumination, trait/pre-sleep state arousal and emotion dysregulation in insomnia disorder. The hypothesis of the study was to determine whether insomnia-specific rumination is related to arousal and emotion dysregulation in subjects with insomnia. To study the possible processes that may underlie the relationships between these variables, we conducted a mediation analysis. Based on the literature, we hypothesized that the sleep-related cognitive processes, in this case insomnia-specific rumination, may play a central role in modulating the relationship between trait- and state-dependent arousal and between arousal and emotion dysregulation in subjects with insomnia.

To address these aims, we evaluated insomnia severity, while controlling for anxiety and depressive symptoms in a sample of subjects with insomnia disorder and in a sample of good sleepers. The hypothesis was that these relationships may be a feature of subjects with insomnia rather than good sleepers. If the hypothesis of the present research were to be confirmed, it could be useful to design strategies for insomnia which also include the evaluation and the treatment of insomnia-specific rumination.

2. Methods

2.1. Selection of subjects and distribution of psychometric questionnaire

Between March 2015 and March 2016, consecutive outpatients visiting the Sleep Center of the Psychiatry Unit II, University of Pisa, Italy, who met the diagnostic criteria for Insomnia disorders (ID) according to the fifth edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5) [1], were recruited for the purposes of this study, together with a group of good sleepers.

The subjects of both groups underwent a face-to-face evaluation conducted by a psychiatrist (L.P.). Their sleep disorders were assessed by clinical evaluation and the use of sleep questionnaires. The evaluation process also considered insomnia severity, insomnia-specific rumination, trait and state pre-sleep arousal, emotion dysregulation, anxiety, and depressive symptoms. The inclusion criteria for subjects with an insomnia disorder [1] were as follows: (1) difficulty in initiating and/or maintaining sleep and/or early morning awakening, (2) for at least three months, (3) sleep disturbance causes clinically significant distress or impairment in important areas of functioning, (4) no sleep-disruptive medical/psychiatric condition, substance abuse, and/or other sleep disorders. Only individuals who reported sleep difficulties for at least three nights per week were enrolled in the study.

The exclusion criteria for subjects with insomnia disorder were: current use of hypnotics or sleep-altering medications, cognitive impairment, a past or current diagnosis of psychiatric disorders, or other sleep disorders (ie, obstructive sleep apnea syndrome, restless legs syndrome, etc.) according to the guidelines of the International Classification of Sleep Disorders (third edition) [2].

Good sleepers were recruited from the hospital and university personnel. Participants underwent a face-to-face assessment and completed the same set of questionnaires used for the subjects with insomnia. The inclusion criteria of the good sleepers were (1) less than 30 min of sleep onset latency, and (2) less than 30 min of wake time after sleep onset in usual nocturnal sleep [52]. The exclusion criteria were the following: (1) subjects previously or currently diagnosed with cognitive impairment, sleep disorders, or psychiatric diseases; (2) habitual use of hypnotics or alcohol at bedtime, (3) subjects engaged in shift-work, and (4) failure to complete the questionnaires. The study conformed to the Declaration of Helsinki and was approved by the local Ethics Committee. All participants provided written informed consent prior to starting the study.

2.2. Sleep scales

Insomnia severity was evaluated with the Insomnia Severity Index (ISI) [26]. The ISI is a seven-item self-reported questionnaire with a recall period of the last two weeks. It is a reliable and valid instrument used to detect cases of insomnia and to estimate insomnia severity. The sum yields a global score ranging from zero to 28. For the purposes of this study, according to the ISI authors' recommendations, an ISI score of 8 or higher indicated insomnia (absence of insomnia sum score zero to seven) [26]. The ISI has been validated in Italian samples [53].

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