Original Article

Metacognitive beliefs relate specifically to sleep quality in primary insomnia: a pilot study

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ABSTRACT

Objective: To identify whether metacognitive aspects are a specific mental pattern of primary insomnia (PI) or an aspecific correlate of sleep alterations.
Methods: Sleep quality (Pittsburgh Sleep Quality Index: PSQI), anxiety (Self-rating Anxiety State: SAS), depression (Beck Depression Inventory: BDI) and metacognition (Metacognitions Questionnaire – Insomnia: MCQ-I) were evaluated in 24 PI patients, 13 snorers and 17 healthy controls. Rank-transformed PSQI, BDI, SAS and MCQ-I scores were submitted to one-way analysis of variance with group as a between-factor. PSQI was submitted to three-way analysis of covariance (ANCOVA) with MCQ-I, BDI or SAS as covariate and group as a between-factor. Post-hoc analyses were conducted using pairwise comparisons with Sidak correction.
Results: As expected, PSQI scores significantly differentiated the three groups, one from another: PI had highest scores followed by snorers and healthy controls. PI subjects had MCQ-I scores significantly higher than those of snorers and healthy controls; no difference between the latter groups was found. The ANCOVA on PSQI with MCQ-I as a covariate abolished the difference in sleep quality between PI and snorers, whereas covarying for BDI or SAS left the differences in sleep quality between the groups unchanged.
Conclusion: These preliminary results lead to two main conclusions: (i) metacognitive aspects are more prominent in PI when compared to snorers and healthy controls; (ii) MCQI shows higher sensitivity in defining PI patients, with respect to PSQI. If these findings are confirmed and expanded by further studies, the development of a specific metacognitive model of primary insomnia may be warranted.

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1. Introduction

Insomnia is a highly prevalent health problem worldwide. Among insomnia patients, 25–30% suffer from primary insomnia (PI) [1,2], which is characterized by difficulties in initiating and/or maintaining sleep, in the absence of psychiatric or medical causes. Fatigue, cognitive impairments and poor motivation with a negative impact on personal, professional, and social functioning are commonly reported and attributed to disturbed night-time sleep [1]. In addition, the chronic alteration of homeostatic properties of sleep in PI makes this sleep disorder a long-lasting stressor *per se*, which alters emotional processing [3,4] and increases the vulnerability for developing depression [5,6] and other somatic diseases [7,8].

It is widely accepted that intrusive, uncontrollable and negative thoughts at bedtime characterize PI patients [9–15]. In addition, maladaptive strategies (ie, metacognitive beliefs including attitudes, expectations and attributions) of thought control in PI patients may fuel further intrusions, generating a vicious cycle which impairs the ability to initiate and maintain sleep [14,15] and potentially modulates chronicity [14–16].

It is well known that cognitive processes play a key role in managing emotions, and hence in modulating physiological arousal and

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behavioral output [10,11,13]. In this context, there is considerable evidence for the efficacy of cognitive behavioral therapy in ameliorating primary insomnia [17–21]. The existing cognitive and behavioral models of insomnia have been recently reviewed by Ong et al. [22], who proposed a novel two-level model of insomnia based on cognitive (primary) and metacognitive (secondary) arousal.

However, the specific nature of the link between metacognitive beliefs and PI needs further clarification. At present, it is not clear whether metacognitive beliefs are exclusively related to PI or are common to all conditions of disturbed sleep.

Herein we investigate whether metacognitive beliefs are pathognomonic symptoms of primary insomnia or are aspecifically related to poor sleep quality. As proposed by Waine et al. [23], snorers have been chosen as control subjects for poor sleep quality since they are devoid of any relevant psychopathological confounding factor, contrary for example to patients with obstructive sleep apnea syndrome [24].

2. Methods

2.1. Selection of subjects and administration of psychometric questionnaires

From January 2012 to December 2012, 24 outpatients (14 females and 10 males, mean age 53 years) attending the Sleep Center of the Clinical Psychology and Psychiatry Units, University of Pisa, Italy, who met diagnostic criteria for PI according to DSM-IV-TR [1] were recruited. Inclusion criteria [1] were: difficulty in initiating and/or maintaining sleep or non-restorative sleep, with at least one associated daytime impairment, for at least one month; absence of any sleep disruptive medical/psychiatric condition and substance abuse; and/or absence of other sleep disorder. The study enrolled only individuals with PI complaining of sleep difficulties for at least three nights per week.

Exclusion criteria were: cognitive decline, previous or present diagnosis of psychiatric disorders, obstructive sleep apnea syndrome (OSAS), restless legs syndrome or other sleep disorders.

Two control groups were enrolled in the study: 17 healthy subjects (nine females and eight males, mean age 50 years) and 13 snorers (seven females and six males, mean age 54 years).

No participants (including PI patients) met the DSM-IV-TR criteria for depression or anxiety [1], nor were receiving any pharmacological and/or psychological treatment as verified by medical examination conducted by a clinical psychiatrist (L.P.). Normal-sleeping participants met research diagnostic criteria for normal sleepers according to Edinger et al. [25].

Snorers were subclinical hypertensive patients complaining of poor sleep quality due to snoring but without signs of OSAS. The lack of OSAS was assessed by a sleep medicine specialist according to the guidelines of the International Classification of Sleep Disorders, second edition [26]:

(A) The patient has a complaint of excessive sleepiness or insomnia. Occasionally, the patient may be unaware of clinical features that are observed by others.

Regarding this point, all snorers had complaints of poor sleep, but not of insomnia.

(B) Frequent episodes of obstructed breathing occur during sleep.

None of the patients in the snorers group (nor their roommates) reported episodes of obstructed breathing occurring during sleep.

Criterion A was partially met whereas criterion B was not met for any of the snorers, and since the minimum condition for a diagnosis of OSAS is the simultaneous presence of criteria A, B and C, diagnosis of OSAS was excluded. As a further confirmation, all snorers underwent all-night O_2 saturation monitoring. Snorers were not pharmacologically treated for hypertension but they all followed a sodium-restricted diet.

The study conformed to the Declaration of Helsinki and was approved by the local ethics committee. All patients provided written informed consent prior to entering the study.

The selected subjects underwent a face-to-face evaluation conducted by a sleep medicine specialist concerning sleep quality, anxiety levels, depressive status and metacognitive beliefs. Sleep quality was evaluated through the administration of the Pittsburgh Sleep Quality Index (PSQI [27]): scores > 5 on PSQI reliably identify clinically significant sleep disturbances [27].

Depressive status was assessed using the Beck Depression Inventory (BDI): the presence of depressive symptoms is defined by BDI scores > 10 [28]. Anxiety levels were assessed with the Self-rating Anxiety Scale (SAS): the presence of clinically relevant anxiety symptoms is defined by SAS scores > 44 [29].

Metacognitive beliefs were evaluated using the Metacognitions Questionnaire –Insomnia (MCQ-I) whose discriminant validity, scale sensitivity and specificity have been demonstrated [23]. The MCQ-I is a questionnaire with 60 items answered using a scale ranging from 1 ('I do not agree') to 4 ('I totally agree'). The questionnaire evaluates beliefs concerning the meaning of the intrusions (eg, 'Thinking in bed prevents me getting to sleep') and plans that guide and shape the form that cognition takes (eg, 'Before I fall asleep, I should try and switch off my thoughts').

The snorer group was specifically selected to test the hypothesis: is strong endorsement of metacognitive beliefs a distinctive feature of PI, or more generally related to poor sleep quality? In the former scenario, poor sleep quality of snorers would not be paralleled by higher MCQ-I scores relative to healthy controls. In the latter case, snorers would have both PSQI and MCQ-I levels halfway between PI patients and healthy controls.

2.2. Statistical analyses

All variables (with the exception of gender) were tested for normality (Shapiro–Wilk test [30]). Variables with non-normal distributions were rank-transformed prior to any further test [31]. As a first step, groups (PI, primary insomnia; S, snorers; C, healthy controls) were checked for gender and age differences. Gender differences were assessed using the χ^2-test, whereas age differences were assessed using one-way analysis of variance (ANOVA) with group as a between-factor.

Scores related to PSQI, BDI, SAS and MCQ-I were rank-transformed and submitted to one-way ANOVA with group as a between-factor [31]. Whenever a significant group-effect was found, post-hoc analyses were conducted using *t*-tests with Sidak correction for multiple comparisons [32].

Putative dependencies of sleep quality differences between the three groups on either metacognitive beliefs (MCQ-I), depression (BDI) or anxiety levels (SAS) were assessed using analysis of covariance (ANCOVA) on ranks [33], with group as a between-factor and MCQ-I, BDI or SAS as a covariate.

The ANCOVA model was chosen as it enables evaluation of whether the means of groups of a dependent variable (PSQI) are equal across levels of a categorical independent variable (group, PI, S and C in our case), while controlling for the effects of another variable (the covariate, MCQ-I, BDI or SAS). Therefore, when performing the ANCOVA, PSQI means are adjusted to what they would be if all groups were equal on the covariate. Whenever a significant group-effect was found, post-hoc analyses on marginal means