

Gratitude influences sleep through the mechanism of pre-sleep cognitions

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Abstract

Objectives: To test whether individual differences in gratitude are related to sleep after controlling for neuroticism and other traits. To test whether pre-sleep cognitions are the mechanism underlying this relationship. **Method:** A cross-sectional questionnaire study was conducted with a large (186 males, 215 females) community sample (ages=18–68 years, mean=24.89, S. D.=9.02), including 161 people (40%) scoring above 5 on the Pittsburgh Sleep Quality Index, indicating clinically impaired sleep. Measures included gratitude, the Pittsburgh Sleep Quality Index (PSQI), self-statement test of pre-sleep cognitions, the Mini-IPIP scales of Big Five personality traits, and the Social Desirability Scale. **Results:** Gratitude predicted greater subjective sleep quality and sleep duration, and less sleep latency and

daytime dysfunction. The relationship between gratitude and each of the sleep variables was mediated by more positive pre-sleep cognitions and less negative pre-sleep cognitions. All of the results were independent of the effect of the Big Five personality traits (including neuroticism) and social desirability. **Conclusion:** This is the first study to show that a positive trait is related to good sleep quality above the effect of other personality traits, and to test whether pre-sleep cognitions are the mechanism underlying the relationship between any personality trait and sleep. The study is also the first to show that trait gratitude is related to sleep and to explain why this occurs, suggesting future directions for research, and novel clinical implications.

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Introduction

Personality is an important predictor of sleep quality and quantity [1]. Most previous research has focused on which personality traits are related to impaired sleeping. Neuroticism has emerged as a robust predictor of sleep quality, with people who are dispositionally stressed, depressed, anxious, and angry being shown to suffer from poor sleep [2–7]. This research has been influential both in developing models of the etiology of insomnia and in developing psychological treatments of sleep disorders [1]. However, the positive psychology movement has emphasized the importance of studying positive aspects of life in addition to the more

traditional psychological focus on psychopathology [8–10]. Positive well-being involves more than the absence of mental illness [11], and positive traits have been shown to explain additional outcomes in health and well-being variables after controlling for neuroticism [12–14]. Recently, positive psychological well-being has been linked to improved quality of sleep [15]. It is not clear, however, whether positive psychological traits can explain sleep quality above the effect of other more traditionally studied personality traits, including the negative traits represented within the construct of neuroticism. Additionally, there is no indication of the mechanisms which explain why positive psychological traits are related to sleep. This study examines these questions with regard to the specific positive psychological trait of gratitude.

Gratitude is perhaps the quintessential positive psychological trait, involving a life orientation towards the positive in the world [16]. In addition to feeling more grateful affect

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[17], grateful people focus on the positive in their environment and have greater appreciation of their possessions and social relationships [18]. As a trait, gratitude is related to positive coping [19], social functioning [20], and has a unique and causal effect on positive well-being and social relationships [14,21,22]. The aim is to investigate whether individual differences in gratitude are related to sleep, after controlling for neuroticism and other personality traits, and to test for the mediational mechanisms underling this relationship.

Only one previous study has indicated that trait gratitude may be related to sleep, and no previous study has suggested mechanisms which may underlie this relationship. Patients with neuromuscular disorders listed three things for which they were grateful each night for 21 nights. Subsequently, their physical and mental well-being was compared with a control group which simply completed outcome measures [21]. The gratitude group self-reported increased hours of sleep and an improved sense of refreshment upon waking. Gratitude was selected as the focus of this study due to this indication that trait gratitude may be related to sleep, and due to the centrality of gratitude as a positive trait [23]. The current study will extend this work by testing which aspects of sleep are related to gratitude, whether this relationship is independent of the effects of other personality traits, and by investigating the mediational mechanisms that may explain the relationship between gratitude and sleep quality.

It is suggested that pre-sleep cognitions may underlie the relationship between gratitude and sleep quality. Pre-sleep cognitions are the thoughts that people have just before sleep. A large literature has linked pre-sleep cognitions with sleep quality [24–29], and experimental evidence has suggested that increased pre-sleep cognitions cause impaired sleep [30–33]. Negative pre-sleep cognitions have attracted particular empirical attention, as precursors of impaired sleep. More recently, positive pre-sleep cognitions are beginning to be studied [24], and there is indication that positive cognitions are related to good sleep quality [34,35]. As there is evidence that gratitude causes a variety of positive cognitions, including life evaluations [21], perceptions of social support [22] and social situations [20], it may be that gratitude is one determinant of pre-sleep cognitions.

Specifically, we suggest that grateful people will have less negative pre-sleep cognitions (which impair sleep) and more positive pre-sleep cognitions (which promote sleep). This is the first empirical study to link trait gratitude to sleep or to suggest mechanisms explaining why this relationship may occur. With gratitude interventions increasingly being promoted in clinical settings [36–38], establishing the mechanisms linking gratitude and sleep will indicate the potential of gratitude interventions for treatment of insomnia. This is also the first study to investigate the potential for positive traits to increase our understanding of sleep above the effects of neuroticism. More generally, this is the first

study to investigate pre-sleep cognitions as a mechanism linking any personality trait to sleep.

Method

Participants and procedure

Participants were 401 (186 male, 215 female) people recruited from the local community by one of two research assistants. Ages ranged from 18 to 68 years (mean=24.89, S.D.=9.02), with 80.3% aged under 30, and 90.1% aged under 40. Participants were either recruited from administrative workers in the head office of a large multinational company in London ($n=200$) or approached at a large chain of coffee shops in the South West of England, a community center in East Midlands, or a local Arts Center in the East Midlands ($n=201$). Participation was voluntary and without payment, and 75% of those approached agreed to participate. Prior to completing the questionnaire the participants read a sheet providing details of the study and ethical information, and participants signed a declaration of informed consent. All measures were completed in English with pencil and paper. Prior to data collection the study was approved according to the institutional review procedures of the University of Warwick, and the research followed the ethical guidelines of the American Psychological Association.

Measures

Gratitude was measured with the GQ-6 [13]. Six items assess the frequency and intensity with which grateful affect is experienced, and the range of events which elicit gratitude [e.g., “I have so much in life to feel thankful for” (Item 1), “I am grateful to a wide variety of people” (Item 4), and “When I look at the world, I don’t see much to be grateful for” (Item 3, reverse coded)]. Items are rated on a 1 (*strongly disagree*) to 7 (*strongly agree*) scale. The GQ6 has a robust one-factor structure, convergent validity with peer reports [13], and high test–retest reliability [22].

Pre-sleep cognitions were measured with the self-statement test [24]. Participants rate how frequently they experience 60 different thoughts, in general, when trying to initially fall asleep or get back to sleep. Items are rated on a 0 (*never or hardly ever*) to 4 (*very often*) scale. Items were developed on the basis of a qualitative study of the thoughts people experience whilst trying to fall asleep and include both positive (e.g., “enjoyable things I did during the last few days”) and negative pre-sleep cognitions (e.g., “bad things happening in the world”). The self-statement test discriminates between insomniac and normal populations (known group validity) and positive and negative thoughts load on different factors [24].

Sleep was measured with the Pittsburgh Sleep Quality Index (PSQI) [39]. Referring to the past month, 19 questions ask about sleep quantity (e.g., “when have you

usually gone to bed at nights?"; "when have you usually gotten up in the morning?"; "how many actual hours of sleep did you get at night?") and sleep quality (e.g., "how would you rate your sleep quality overall?"). Responses are made in a variety of formats; all responses are recoded on a 0–3 scale based on the ranges specified by the scale development paper (the recoding also has the effect of removing the effect of extreme outliers). A total sleep score is formed, in addition to seven subscales representing *subjective sleep quality*, *sleep latency* (how long it takes to get asleep), *sleep duration*, *sleep efficiency* (hours spent asleep divided by number of hours in bed), *sleep disturbances*, *use of sleep medicine*, and *daytime dysfunction* (e.g., difficulty staying awake during the day). The total sleep score and all subscales are scored so that higher scores indicate more impaired sleep and higher sleep dysfunction. The PSQI can be used as a continuous measure of the continuum of impaired sleep. Alternatively, using a total score >5 has been shown to discriminate between groups of healthy volunteers and groups referred to sleep disorder clinics by physicians for sleep disorders (sensitivity and specificity of >85%) [39]. The scale is one of the most widely used measures of sleep in clinical research and practice.

The *Big Five* personality traits were measured with the Mini-IPIP scales [40]. The personality factors of neuroticism, extraversion, agreeableness, conscientiousness, and openness are assessed with 20 items (four per factor, including a mixture of positively and negatively worded items). These five traits have been shown to represent all of personality at the broadest level of abstraction [41,42]. The Mini-IPIP shows very good test–retest reliability, convergent, discriminant, and criterion-related validity, which is comparable to the NEO and other measures of the Big Five [40].

Social desirability was measured with the Social Desirability Scale-17 [43]. Sixteen items (seven reverse coded) provide statements with which most people would like to agree but are probably unable to do so truthfully (e.g., "I always accept other's opinions, even when they don't agree with my own"). (The measure originally had 17 items, but one item was deleted in the scale validation process; we used the revised 16-item version as recommended by the authors [43].) Participants respond "true" or "false" to each item, and higher scores represent socially desirable responding. The measure was developed due to concerns that the items in older measures were no longer socially desirable. The measure shows sensitivity to socially desirable situations (e.g., job applications), good convergent validity, and all items have recently been rated as socially desirable [43].

Results

The total PSQI score was approximately normally distributed. The mean total PSQI score was 5.44 (S.D.=2.57), slightly higher than representative population surveys

(mean=4.55, S.D.=3.71, t [1390]=4.45, $d=.28$) [44]. At the standard cut-off point of 5, 161 people (40%) could be classified as poor sleepers (compared to 32.1% in population surveys).

In the total sample, higher scores on the GQ-6 were positively associated with superior sleep quality (indicated by lower scores on the PSQI), with gratitude negatively correlating with six measures of impaired sleep quality: total sleep quality ($r=-.29$, $P<.001$), subjective sleep quality ($r=-.25$, $P<.001$), sleep latency ($r=-.20$, $P<.001$), sleep duration ($r=-.14$, $P<.01$), habitual sleep efficiency ($r=-.11$, $P<.05$), and daytime dysfunction ($r=-.27$, $P<.001$). Gratitude was also positively correlated with positive pre-sleep cognitions ($r=.21$, $P<.001$) and negatively correlated with negative pre-sleep cognitions ($r=-.11$, $P<.001$). A series of multiple regressions were conducted to test whether the relationship between gratitude and sleep was mediated by positive and negative pre-sleep cognitions, using Baron and Kenny's [45] three mediational steps and the Sobel test [46]. As gratitude was positively correlated with extraversion, agreeableness, and conscientiousness, and negatively correlated with neuroticism (r ranged from $|.23|$ to $|.35|$, all $P<.001$), the Big Five traits and social desirability were also included as predictor variables in each of the regressions in order to control for the effects of these traits at each stage of the analysis.

Baron and Kenny's [45] first step requires the predictor to be related to the outcome. With the effects of the Big Five and social desirability controlled, gratitude still significantly predicted total sleep quality ($\beta=-.24$, $P<.001$), subjective sleep quality ($\beta=-.25$, $P<.001$), sleep latency ($\beta=-.17$, $P=.002$), sleep duration ($\beta=-.15$, $P=.006$), and daytime dysfunction ($\beta=-.16$, $P=.003$). Gratitude was not uniquely related to sleep efficiency ($\beta=-.08$, $P=.144$), failing Baron and Kenny's first step; this variable was not included in any further analysis.

The second step was conducted separately for each of the five sleep variables with which gratitude showed a unique relationship (these are presented as path diagrams in Fig. 1, where each of the path values shown is independent of the effects of social desirability and the Big Five). This step requires the mediators (pre-sleep cognitions) to be significantly related to the outcome (the sleep measure) after controlling for the predictor (gratitude). As shown in Fig. 1, this step was met in each case.

In the third step, mediation is demonstrated if controlling for the mediator significantly reduces the relationship between the predictor (gratitude) and the outcome (sleep) relative to the zero-order correlation. Sobel's z tests whether the decrease in β is statistically significant and is mathematically equivalent to testing the significance of the mediated pathway [46]. Fig. 1 shows Sobel's z for each mediated pathway and demonstrates that either positive or negative pre-sleep cognitions significantly mediated the relationship between gratitude and each of the five measures of sleep (fulfilling the third step). Positive pre-sleep cognitions

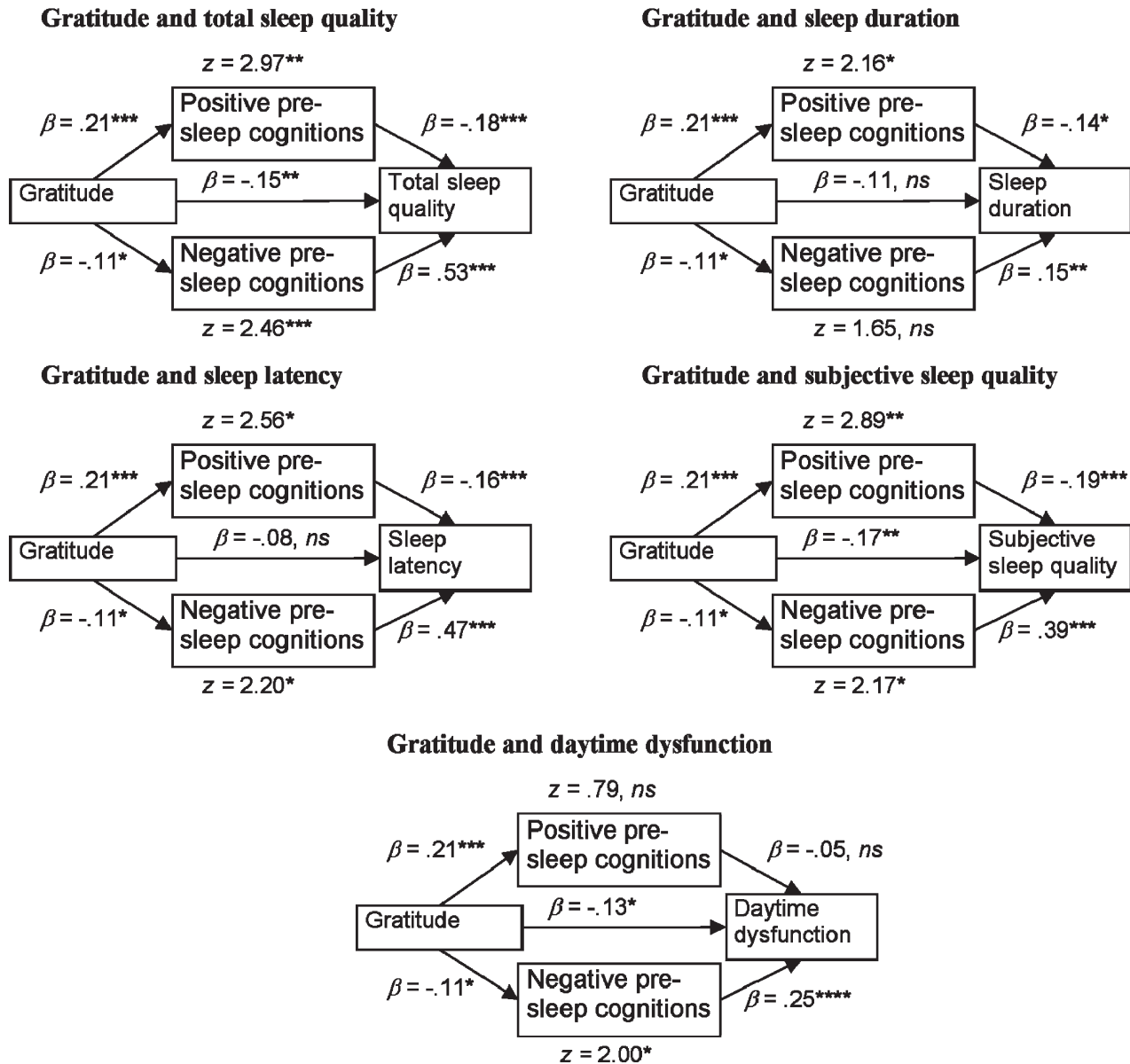


Fig. 1. Tests of mediation between gratitude and five sleep measures, with standardized β 's and Sobel's z . All values are after covarying the effects of social desirability and the Big Five. $***P < .001$, $**P < .01$, $*P < .05$.

mediated the relationship between gratitude and subjective sleep quality, sleep duration, sleep latency, and sleep efficiency. Negative pre-sleep cognitions mediated the relationship between gratitude and subjective sleep quality, sleep latency, sleep efficiency, and daytime dysfunction.

Discussion

Gratitude was uniquely related to total sleep quality, subjective sleep quality, sleep latency, sleep duration, and daytime dysfunction, after controlling for the effects of the Big Five and social desirability. The results of the current study also provide evidence that pre-sleep cognitions

mediate the relationship between trait gratitude and sleep quality. When falling asleep, grateful people are less likely to think negative and worrying thoughts, and more likely to think positive thoughts. It appears that negative pre-sleep cognitions impair sleep, and gratitude reduces the likelihood of such thoughts, protecting sleep quality. Equally, it appears that positive pre-sleep cognitions have a positive effect on sleep, and that gratitude facilitates these thoughts, leading to superior sleep quality.

It is notable that gratitude was related to sleep and pre-sleep cognitions after removing the effects of the Big Five personality traits. This suggests that gratitude is not simply linked to sleep due to the third variable effects of broad personality traits or dispositional affect. Increasingly, there is

evidence that gratitude can predict well-being outcomes above the effects of other personality traits [13,17,20,22], including social desirability [18], coping [19], and the 30 facets of the Big Five [14]. The present results suggest that gratitude may also uniquely be related to sleep, at least above the broad effects of the Big Five. As positive and negative affect are respectively represented in the Big Five traits of extroversion and neuroticism [47], the results suggest that the relationship between gratitude and sleep is not simply a reflection of the relationships between gratitude and positive affect (or “happiness”) or negative functioning (e.g., stress, depression, anxiety, and negative affect). The Big Five traits can, however, achieve broad coverage of the personality domain at the expense of specificity [48]. Future research should measure positive and negative affect specifically to test whether the mechanism linking gratitude and sleep is purely cognitive (as indicated by the current demonstration of mediation via pre-sleep cognitions) or whether daily affect forms a second mediational pathway.

More research is needed into whether other positive traits can explain sleep and sleep disorder, in order to develop more complete models of sleep functioning. Research is also needed into whether increasing positive traits improves sleep. Emmons et al. show that therapeutically increasing gratitude can increase sleep quality [21]. Further work is needed to explore the efficacy of this approach in insomnia patients to test whether including a focus on gratitude can improve existing sleep therapies and whether pre-sleep cognitions are the mechanism through which the therapy operates.

The study had some limitations, including the reliance on self-report measures. This was partially mitigated by the use of the PSQI measure of sleep (which discriminates between groups of healthy people and physician-referred insomniacs with sensitivity and specificity of >85%) [39] and through showing that the results were not confounded with socially desirable responding. Self-reports of sleep are also important in themselves, given that most people self-refer to sleep clinics. There is also evidence that mood and objective daily performance is more strongly related to the self-report of sleep quality than to sleep quality measured through neuropsychological assessment [49]. However, further research is needed into whether gratitude and other positive traits are related to objective sleep assessment measured by EEG (actual sleep measured through brain waves) or actigraphy (actual sleep measured via wrist movements). The current study also used a community sample, rather than a sample of people clinically diagnosed with insomnia. The community sample had the advantage of a wide range of both personality and sleep quality, whereas a slanted clinical sample would probably have exhibited range restrictions, producing biased statistical analysis. However, future research is needed into whether the findings extend to clinical samples, perhaps using the experimental methodology discussed above. Finally, as the study was cross-sectional it is not possible to demonstrate causality, and the

mediational analysis relies on the variables being arranged in the correct order, which is normally inferred on the basis of previous research [45]. However, given that gratitude has been previously shown to cause better sleep [13], pre-sleep cognitions have been shown to causally influence sleep [30–33], and gratitude causally influences cognitions [20–22], it seems likely the causal chain was correctly arranged in the mediational analysis.

The results present the first indication that individual differences in gratitude are related to sleep quality and suggest that this is due to the mechanism of pre-sleep cognitions. More research is needed into the role of gratitude and other positive traits in relation to quality of sleep in both healthy and clinical populations. Such a positive psychology approach to sleep could potentially provide better understanding of the etiology of sleep disorders, explanation of positive sleep quality, and lead to new therapies to treat sleep disorder and promote optimal sleeping amongst the general population.

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